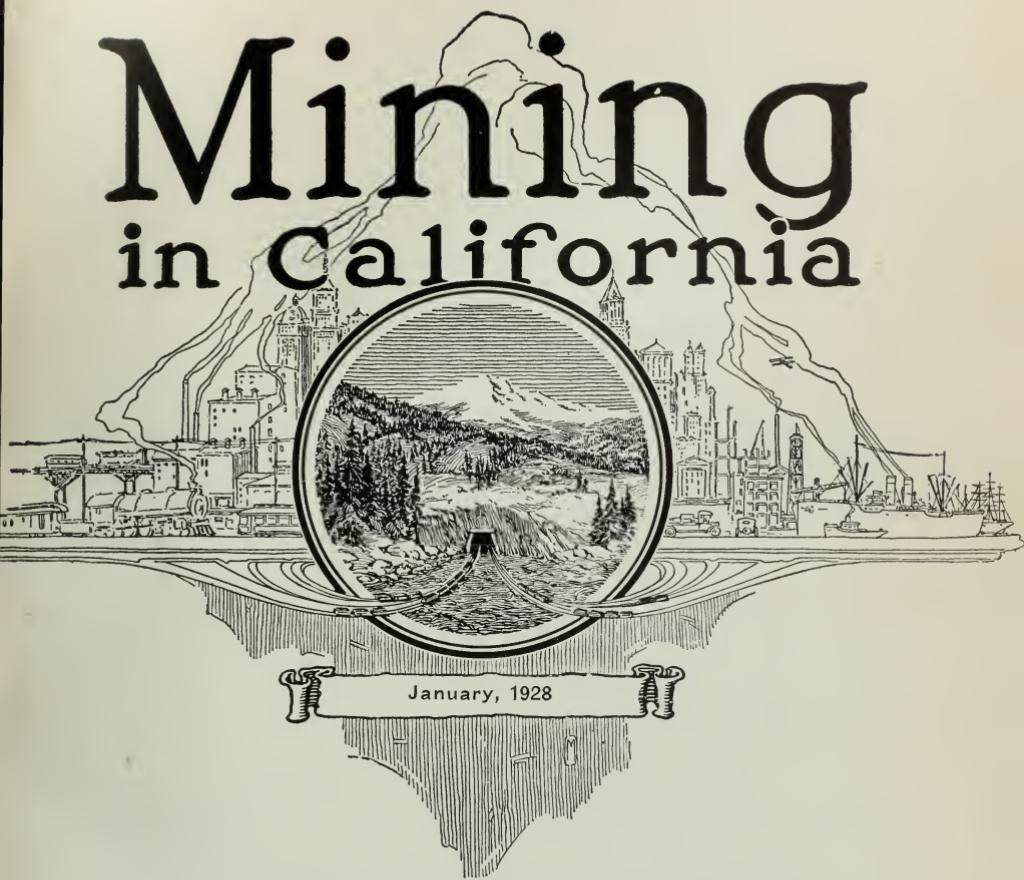




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Mining in California



PUBLISHED QUARTERLY

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DIVISION OF MINES AND MINING

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NOTE.—A detailed report of the activities of the Department of Petroleum and Gas is issued monthly by the Division of Mines and Mining, entitled 'Summary of Operations, California Oil Fields.'

STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES

DIVISION OF MINES AND MINING
FERRY BUILDING, SAN FRANCISCO

LLOYD L. ROOT

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No. 1

CHAPTER OF

REPORT XXIV OF THE STATE
MINERALOGIST

COVERING

MINING IN CALIFORNIA

AND THE

ACTIVITIES OF THE DIVISION OF MINES
AND MINING





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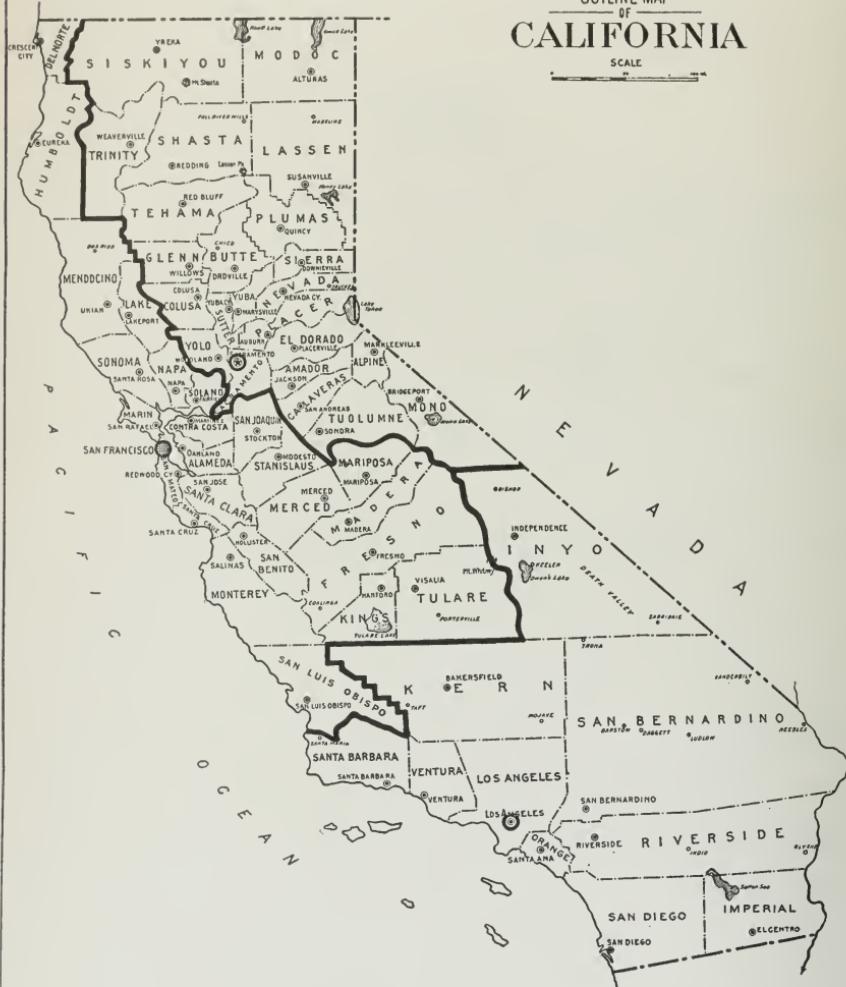
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State of California
DIVISION OF MINES AND MINING
LLOYD L. ROOT
STATE MINERALOGIST

OUTLINE MAP
OF
CALIFORNIA

SCALE



- LEGEND -

- Mining Division Boundaries
- Mining Division Offices.

M E X I C O

PREFACE.

The Division of Mines and Mining (formerly State Mining Bureau) is maintained for the purpose of assisting in all possible ways in the development of California's mineral resources.

As one means of offering tangible service to the mining public, the State Mineralogist for many years has issued an annual or a biennial report reviewing in detail the mines and mineral deposits of the various counties.

The weak point in work of this character has been that the results of field investigations were so long in preparation that they had lost much of their usefulness by the time they finally appeared in print.

As a progressive step in advancing the interests of the mineral industry, publication of the Annual Report of the State Mineralogist in the form of monthly chapters was begun in January, 1922, and continued until March, 1923.

Owing to a lack of funds for printing this was changed to quarterly publication, beginning in September, 1923.

For the same reason, beginning with the January, 1924, issue, it has been necessary to charge a subscription price of \$1 per calendar year, payable in advance; single copies, 25 cents apiece. 'Mining in California' will continue to be sent without charge to our exchange list, including schools and public libraries, as are also other publications of the Division of Mines and Mining.

Pages are numbered consecutively throughout the year and an index to the complete reports is included annually in the closing number.

Such a publication admits of several improvements over the old method of procedure. Each issue contains a report of the current development and mining activities of the state, prepared by the district mining engineers. Special articles dealing with various phases of mining and allied subjects by members of the staff and other contributors are included. Mineral production reports formerly issued only as an annual statistical bulletin are published herein as soon as returns from producers are compiled. The executive activities, and those of the laboratory, museum, library, employment service and other features with which the public has had too little acquaintance also are reported.

While current activities of all descriptions will be covered in these chapters, the practice of issuing from time to time technical reports on special subjects will be continued, as well. A list of such reports now available is appended hereto, and the names of new bulletins will be added in the future as they are completed.

The chapters will be subject to revision, correction and improvement. Constructive suggestions from the mining public will be gladly received, and are invited.

The one aim of the Division of Mines and Mining is to increase its usefulness and to stimulate the intelligent development of the wonderful, latent resources of the State of California.

DISTRICT REPORTS OF MINING ENGINEERS.

In 1919-1920 the Mining Department was organized into four main geographical divisions, with the field work delegated to a mining engineer in each district, working out from field offices that were established in Redding, Auburn, San Francisco and Los Angeles, respectively. This move brought the office into closer personal contact with operators, and it has many advantages over former methods of conducting field work. In 1923 the Redding and Auburn field offices were consolidated and moved to Sacramento.

The boundaries of each district were adjusted and the counties now included in each of the three divisions, and the locations of the branch offices, are shown on the accompanying outline map of the state. (Frontispiece.)

Reports of mining activities and development in each division, prepared by the district engineer, will continue to appear under the proper field division heading.

Although the petroleum industry is but little affiliated with other branches of mining, oil and gas are among the most valuable mineral products of California, and a report by the State Oil and Gas Supervisor on the current development and general conditions in the state's oil fields is included under this heading.

New County Reports.

The series of separate reports on the mines and mineral resources of the different counties, that together comprise the State Mineralogist's Reports XIV to XVII, inclusive, in the case of many of the counties have become exhausted. Those still in stock are in need of revision. It was deemed advisable, therefore, beginning with the January, 1925, issue of 'Mining in California,' to make the district engineers' reports in the form of a complete general report on the mines and mineral resources in one or more of the counties in each district.

This program will be followed as near as possible in succeeding numbers of the quarterly until each county in the state has been covered.

SACRAMENTO FIELD DIVISION.

C. A. LOGAN, Mining Engineer.

TUOLUMNE COUNTY.**Geography.**

The county is separated from Alpine and Mono on the east and north by the summit of the Sierra Nevada. The North Fork of Stanislaus River separates it on the northwest and west from Calaveras. Stanislaus and Mariposa lie on the south. The southern half of the county comprises the entire drainage basin of Tuolumne River and the three forks of Stanislaus River drain the northern part. The western county line extends almost to the San Joaquin Valley, and has an elevation of only 265 feet, but along the eastern border stand many high peaks, including Mt. Lyell, 13,090 feet high, and Mt. Dana, 13,050 feet. Sonora, the county seat, is at an elevation of 1825 feet in the western part. Lumbering is the most important industry, with logging operations extending into the mountains and with plants at Tuolumne, Standard and Sonora. Most of the mining has been in the western section from Confidence (elevation 4200 feet) south and west. Roads enter the county from the west at Melones (Robinson's Ferry) and from Oakdale. The state highway, branching near Chinese Camp, has one branch running through Sonora, Tuolumne, Confidence and over Sonora Pass into Mono County, and the other to Yosemite Valley via Jacksonville and Big Oak Flat. The Sierra Railway of California crosses the western part of the county from Cooperstown to Tuolumne, serving the mines of the Mother Lode and the marble and limestone quarries.

Electric power for mining is available along the Mother Lode and in most of the 'east belt' districts. Timber, of course, is abundant only a few miles east of the Mother Lode. Water has been used at many properties for power, but is being rapidly appropriated for other purposes.

Mineral Resources.

The most important mineral products are gold, marble and limestone. The Mother Lode crosses the western side of the county. An East Belt extends past Tuolumne, Soulsbyville and Arastraville, with many scattered properties in nearby districts. Limestone and marble are abundant, a large belt extending from three miles south of Sonora to the county line north of Columbia and into Calaveras County. The Columbia district has been the seat of an important marble quarrying industry for many years and limestone and lime are being produced near Sonora. Chromite and copper have been produced and in recent years magnesite deposits have been opened, but there is no mining of these minerals now going on. Soapstone, clay, diatomaceous earth and mineral paint deposits are known but undeveloped.

MINERAL PRODUCTION OF

Year	Gold, value	Silver, value	Lime		Limestone	
			Barrels	Value	Tons	Value
1880	\$461,861	\$1,071				
1881	500,000	1,000				
1882	400,000					
1883	320,000					
1884	310,000					
1885	320,903	1,473				
1886	432,438	1,551				
1887	504,662	3,166				
1888	475,000	3,500				
1889	446,300	543				
1890	1,500,629	13,062				
1891	1,384,950	139				
1892	1,002,549	911				
1893	354,734	1,329				
1894	547,448	1,072				
1895	666,754	313				
1896	1,070,141	328				
1897	1,809,572	1,696				
1898	1,734,953	15,582				
1899	1,635,769	15,111				
1900	1,596,891	62,367				
1901	1,670,368	39,787				
1902	1,791,829	6,580				
1903	1,732,572	13,989	1,600	\$1,600		
1904	1,563,907	12,963				
1905	1,291,726	21,348	500	1,000		
1906	1,039,675	8,476	500	1,000		
1907	806,875	6,453	110,000	125,000		
1908	798,752	11,732	60,000	69,500	1,233	\$6,500
1909	925,703	4,384	60,000	60,000	15,057	28,942
1910	615,626	5,754	78,300	78,300	3,600	10,400
1911	1,093,484	13,243	75,000	70,000	4,319	13,609
1912	1,113,291	25,146	117,450	121,250	11,554	20,099
1913	974,409	24,381	75,000	85,000	12,446	20,676
1914	940,793	12,017	63,331	38,000	16,707	21,907
1915	1,058,103	13,480	2		8,859	11,349
1916	868,237	17,039	2		3,137	5,132
1917	321,085	7,808	2		3,287	6,481
1918	274,328	21,425	2		3,064	5,600
1919	471,021	11,076	2		2	
1920	254,560	6,007	2		7,494	15,288
1921	96,026	2,505	2		3,650	9,475
1922	222,366	2,976				
1923	261,936	2,801			3,140	7,680
1924	255,994	1,106			8,515	19,983
1925	155,592	614				4268,000
1926	119,873	1,119				
Totals	\$38,283,694	\$418,423	641,681	\$650,650	106,062	\$481,121

¹ Includes mineral paint and sandstone.² Includes granite, lime, magnesite, marble.³ Includes clay, dolomite, granite, lime, marble.⁴ Includes lime.⁵ Includes dolomite, granite, marble.⁶ Includes granite, lead, lime, limestone, magnesite, marble, silica.⁷ Annual production figures for certain minerals, such as limestone and marble, are concealed under miscellaneous and unapportioned items because there was only one producer of each of these minerals.

SACRAMENTO FIELD DIVISION

5

TUOLUMNE COUNTY, 1880-1926.

ASBESTOS.

H. Favot, Moccasin P. O., has a deposit of short-fiber chrysotile asbestos up to one inch in length on the Hetch Hetchy railroad and 1500 feet from a wagon road. There are two claims, on which a little work has been done.

W. E. Finch, Box 583, Sonora, has a deposit of short-fiber asbestos up to one inch long, on a 20-acre claim.

CHROMITE.

Some chromite deposits in the county were productive before 1914, but most of them were actively developed between then and 1919. Serpentine and the rocks from which it is derived, which are the source of this ore, extend along the Mother Lode from the southerly county line near Penon Blanco at intervals almost to the Calaveras County line, and a much larger body of these rocks, three to four miles wide, extends from seven miles southeast of Chinese Camp for many miles in a northwesterly direction. About 500 tons of chromite had been shipped from the Mackey Ranch and half as much from the Mariauno Ranch previous to 1914. The other properties in the tabulation below became active in 1916-1917 and produced from one car upward, but most of them yielded only a small tonnage. The total recorded chromite production of the county has been 7813 tons, of which 2680 tons was produced in 1917 and 4269 tons in 1918.

Table of Chromite Deposits, Tuolumne County.

Name	Location	Railroad Station	Ownership
Don Pedro	Sec. 6, T. 2 S., R. 14 E.	8 mi. Keystone	Sold for taxes
Hughes	SE. of Jacksonville		Hughes Bros.
Kahl	Sec. 6, T. 1 N., R. 14 E.	6 mi. Jamestown	Jos. Kahl
Mackey	Sec. 21, T. 1 N., R. 14 E.	3 mi. Jamestown	Est. of P. Mackey
Madrid	Near Tuttletown	Tuttletown	
Marianno	Secs. 4, 5, 8, 9, T. 1 S., R. 14 E.	1½ mi. Chinese	J. F. Marianno, Chinese
Rough and Ready	Secs. 25, 26, T. 1 N., R. 14 E.	3½ mi. McCormick	E. T. Richards, et al.
Sims	Sec. 5, T. 1 S., R. 14 E.	1 mi. Chinese	Henry Sims
McCormick	Sec. 2, T. 1 S., R. 13 E.	1 mi. McCormick	M. McCormick Co.

Other operators who worked on unpatented claims between 1916 and 1919, were:

Lighthold & Adams, near Hughes property.

J. Null, Chinese.

Pereira, 540 acres, three miles north of McCormick siding in Sec. 25, T. 1 N., R. 13 E.

H. Pericone, Chinese Camp.

G. M. Porter, et al., Chinese Camp.

A. Swerer, Tuttletown.

C. E. Wilcox, Jamestown.

COPPER.

The foothill copper belt extends across the southwestern end of the county, one branch entering at Byrne's Ferry, west of Chinese, and crossing in a southeasterly direction through the Don Pedro and Corner districts where the Salambo and Oak Hill properties are found. On the so-called east branch of the belt, which enters a mile west of Tuttletown, numerous shallow cuts and shafts are found for a width of several miles extending in a direction about parallel to and west of the Mother Lode, through Chinese Camp to Moccasin Creek. The Oak

Hill and Washington (now the Salambo) have been the principal producers.

Donahue Ranch Prospect is in Sec. 23, T. 2 S., R. 14 E., where an old adit, reported to be 1000 feet long, was driven.

Kahl Ranch in Sec. 6, T. 1 N., R. 14 E., has copper indications which have been slightly prospected.

Mackey Ranch. A copper prospect occurs on this property in SW $\frac{1}{4}$ Sec. 21, T. 1 N., R. 14 E., 2½ miles south of Jamestown. Chalcocite occurs in schist and serpentine. In 1915, twelve tons was shipped from a vein a few inches to one foot wide which assayed 9% copper. The ore also carries about \$2.50 a ton in gold and silver. The entire copper-bearing vein averages perhaps ten feet wide.

Mann Prospect is in sections 27, 28, T. 1 N., R. 14 E., adjoining the Mackey Ranch on the southeast. The prospect is similar to and a continuation of that on the latter property and is up to 20 feet wide. A few tons of ore has been mined.

Marianno Ranch Prospect is two miles south of Chinese station in the serpentine belt.

Mitchell (Bonne Terre) Mine is a mile west of the Oak Hill Mine. The ore is complex, containing copper, zinc, gold and silver. There is an old shaft 125 feet deep, but no work has been done recently.

Oak Hill Mine is in Sec. 23, T. 2 S., R. 14 E., four miles southeast of Cooperstown, which is on the Sierra Railway. Like so many others of similar character in the foothill copper belt, it was worked first as a gold mine, the upper oxidized portion of the vein paying handsomely to a depth of about 100 feet, where sulphide ore containing pyrite and chalcocite was encountered and at greater depth chalcopyrite. After this early work it lay idle until 1901, from which time it was a small producer at intervals for several years, it being stated that in 1908, 1000 tons of ore carrying 7% copper and several dollars gold per ton was shipped for smelting. The vein occurs in a country rock of augite-porphyrite and two ore shoots were worked, having widths up to six feet each. The principal shaft was 350 feet deep with three levels and a total of nearly one-half mile of underground workings.

Salambo (Washington) Mine is in the southwestern part of the county near the Mariposa County line. It is stated that at one time it supported a village of 400 people, which was burned down, and the mine lay idle many years. It contains three unpatented claims along the porphyrite, where a lens of this greenstone separate from the main mass intrudes the Jurassic slate. Salambo Mining Company, care of L. R. Johnson, Merced, owns the property.

DASH ROCK.

Various kinds of rock have been used the past few years for stucco dash. Hard, clean and brightly colored stones which will not crumble while being crushed or after exposure to the weather are required.

White dolomitic marble has been shipped from the Sonora-Columbia marble belt.

Mariposite and white quartz have been shipped from mines on the Mother Lode near Jamestown and Stent.

DIATOMACEOUS EARTH.

This mineral occurs in the extreme western part of the county, near the state highway, but quite a distance from the railroad. It is reported to be a comparatively small deposit but of good grade, and has not been developed.

FLUORSPAR.

W. E. Finch, Box 583, Sonora, reports finding fluorspar in the county but no particulars are available.

GOLD (QUARTZ MINES).

The Mother Lode crosses Tuolumne County from Stanislaus River at Robinson's Ferry, through Whiskey Hill one mile west of Jamestown and through Quartz Mountain and Stent and thence southeast along the east side of Woods Creek and Tuolumne River into Mariposa County. Most of the mines along the lode here have been found in the amphibolite schist or along the contact of the schist, serpentine or other metamorphosed igneous intrusives, with the Calaveras formation. The ore consists largely of altered and mineralized schist or igneous rock, and is in places essentially a dolomite sulphide ore. Near the serpentine and amphibolite the ore may be talcose and in some cases is a complex mixture of tale, dolomite and quartz with 3% to 5% of sulphides, mostly pyrite but with some galena. The larger orebodies are roughly lenticular. Small deposits of rich ore in the form of quartz stringers in Calaveras slate at their contacts with a small dike, made the Jumper and Golden Rule mines famous. At the Rawhide Mine rich ore occurred along a contact of Calaveras rock and serpentine. On Jackass Hill and at Tuttletown, a little east of the line of the lode proper, many pocket mines were worked on quartz stringers or gash veins irregularly distributed in the amphibolite schist. But as a general rule, the Mother Lode ores of this county have been of low or average grade, so that the mines have felt keenly the effect of increased operating costs, and most operations along the lode here have been suspended.

The 'east belt' mines lie east of the Mother Lode in the granodiorite and Calaveras formations. Many of the former gold quartz producers of importance, such as the Black Oak, Confidence, Soulsby, Providence and Dead Horse, are in this group, but at present there are no active producers. These mines, as a group, are on comparatively narrow veins of solid or ribbon quartz, containing small ore shoots of high grade ore carrying free gold, pyrite, galena, zincblende and less common sulphides. The ore may occur at intersections or contacts of the vein with igneous dikes, and in either the granodiorite or Calaveras rocks or at their contact. These mines are scattered over a large area, but share in general the same characteristics.

Between the 'east belt' and the Mother Lode is a group of pocket mines near Sonora and Columbia, which have produced a great deal of gold, and continue to yield small amounts occasionally.

The following notes summarize quartz mining and prospecting operations carried on in the county during the past ten years. There is also given a table of quartz mines, giving the names and locations of such properties, with the ownership as indicated on the county assess-

ment rolls, and a bibliography of state mining bureau publications where the past operations and geology of properties are discussed.

The future of gold mining on the Mother Lode here depends on the application of large-scale operations with a low unit cost. Such ore as is known is low grade. The section of the lode from Robinson's Ferry to the Rawhide Mine has been prospected by shafts (the deepest 1100 feet) and limited exploration, without the development so far of an important producer, but with many low-grade prospects of fair working width reported. The development of this section has been set back many years by the ill-advised erection of a number of mills by small, poorly financed companies, before any ore was assured. The section is not one for small operations. In saying this, the vicinity of Jackass Hill and pocket mines nearby are excepted. The sulphide concentrate is generally low grade so that means of treatment on the property, such as cyanidation, are preferable to avoid the cost of shipment and smelting charges.

Large-scale work has indicated that oil flotation, while successful, did not give decided advantages over the regular stamp-milling and concentration practice, and cost more.

On the East Belt, because the veins are generally narrow and only relatively small tonnages of ore are to be expected, conditions call for small installations. Higher unit costs and higher grades of ore have been the rule. In such mines, following the ore with shafts would seem to be better practice than driving long adits. Mills of five or ten stamps are generally enough. The complex sulphide concentrate does not lend itself so readily to cyanidation, although this practice was followed successfully at the Black Oak Mine. The galena usually present in the best milling ores of this belt has often given losses by sliming when crushed by stamps in the ordinary way.

The following shows the approximate gross production of the principal mines of the county. These figures are in no way official, and have been gathered from various sources. Comparatively few quartz mines have been productive in the county the past ten years and production was distributed previously over such a long period and was made by so many companies now out of existence, that original records are not available.

Approximate Production of Tuolumne County Mines.

<i>Mother Lode Mines.</i>		<i>East Belt Mines—Continued.</i>	
Alabama	\$150,000	Confidence	\$3,250,000
App-Heslep	6,500,000	Draper	1,000,000
Clio	140,000	Excelsior	420,000
Crystalline, about	100,000	Experimental	150,000
Dutch-Sweeney	3,000,000	Gilson	1,250,000
Eagle Shawmut	5,000,000	Green	200,000
Harvard	2,500,000 to	Grizzly	1,500,000
Jumper	3,000,000	Hunter	300,000
Rawhide	5,000,000	Keltz	300,000
Santa Ysabel	6,000,000	New Albany	200,000
	1,500,000	Providence	700,000
<i>East Belt Mines.</i>		SoulSBY	5,500,000
Black Oak	3,500,000	Spring Gulch	250,000
Buchanan	600,000	Other East Belt Mines	1,500,000
Total estimated pocket mine production		\$5,500,000	
of which the Bonanza produced about		\$2,000,000	
Sugarmen produced about		350,000	
Jackass Hill Mines produced about		500,000	
Colby produced about		200,000	
<i>Miscellaneous.</i>			
Golden Gate		\$1,500,000	
Patterson		350,000	
McCormick		160,000	
2,575,52			

Alabama claim, on the Mother Lode a mile west of Jamestown and north of the Crystalline, was prospected by Tonopah Mining Company of Nevada in 1922 and 1923. Working through the shaft of the Crystalline mine on the south, they drove a long drift under the Alabama on the 600-ft. level, but gave up their option.

App Mine (See Dutch App Group).

Belmont Shawmut Mine (See Eagle Shawmut).

Bonanza Mine is the most noted of the pocket mines in the county and has been frequently described. It is at the north end of Sonora, at the contact of limestone on the east and Calaveras mica schist on the west. The gold-bearing zone is a diorite dike up to 16 feet thick, with casings of quartz on both walls in the upper part of the mine, and a quartz seam within. It strikes N. 30° E. and dips 20° to 35° NW., crossing the strike and dip of schistosity of the schist.

This mine was discovered in 1851 and has yielded fortunes to several successive groups of owners under romantic circumstances. The total reported output has been between \$1,500,000 and \$2,000,000, found entirely as 'pocket' gold. The workings, following the dip and cleavage of the slaty schist, have reached a total inclined depth of 2700 feet on an angle of 20° . It is stated that granodiorite was encountered in the bottom.

Black Oak Mine. Although this mine has been closed ten years, a short notice of its operations may be of interest as it was the last of the East Belt mines worked successfully, and by modern methods. It is a mile west of Soulsbyville.

The vein averaged two feet in width, but had a maximum width of 25 feet with branches into the hanging wall and both walls were granodiorite. The ore formed at the crossings of diorite dikes. The vein filling was quartz, diorite and granodiorite. The sulphides arsenopyrite, pyrite, pyrrhotite, marcasite, galena and zincblende occurred, and there were two ounces of silver for each one of gold. A series of reverse faults threw the vein toward the west, looking north. There were three shafts, of which the deepest, and last used was 1800 feet deep on 70° incline, with a winze 100 feet deeper.

The all-sliming method of cyanidation was used. Twenty 1250-lb. stamps dropping six inches 100 times a minute, crushed the ore to 10-mesh in 1.85% cyanide solution. The pulp was classified, coarse passing to a 5-ft. by 18-ft. tube mill, and finely ground ore was thickened to 2 to 1 consistence and treated by agitation in three Pachuca tanks 10 ft. by 30 feet. After this treatment, pulp was thickened, overflow from thickener was pumped to clarification and precipitation presses, and thickened portion was filtered. Resulting solution was again filtered and clarified and the clarified solution was passed to a precipitation press and zinc dust used to precipitate the gold. The recovery was 96% on an ore carrying \$13 to \$20 a ton. The total operating cost (of mining, milling, developments, etc.) in 1914 was \$7.59 a ton. The average treatment cost was reduced from \$2.24 a ton (labor and material) in 1914 to \$2.08 a ton in 1917, the saving having been made in the labor item. An average of 70 to 75 tons of ore was treated daily. The following material was used per ton of ore

treated: Cyanide, 1.19 lb., lime, $2\frac{1}{2}$ lb., zinc dust, 0.82 lb., litharge, 0.54 lb., pebbles, 5 lb.

Casa Madera Gold Mining Syndicate has continued prospecting its claims near Mt. Lewis, 15 miles by mountain road from Tuolumne. When the prospect was visited October 12 last, the superintendent could not point out any proved ore. After a brief underground and surface inspection, the writer concluded that the recent work, since the adit and raise entered soft ground, has been carried on in a fault zone. From all information obtainable, the workings so far have not revealed a payable orebody, although about 2000 feet of underground work had been done.

A Herman mill with a capacity of 40 tons daily to 10 mesh was installed, and a cyanide plant with a capacity of 200 tons of ore daily, under favorable conditions (but at present without any other primary crushing unit than the above) was completed early in 1927, and a test run was made, but the resulting clean-up was reported disappointing. It is stated that about \$300,000 had been raised for the use of the company by the sale of stock and by assessments up to the middle of 1927.

These claims are supplied with electric power over a line three miles long from Confidence. There are two small air compressors, and a hoist from the top of the ridge connects with No. 1 adit. A flow of several inches of water was issuing from the adit when visited. There are several camp buildings.

Chileno, Carrington, Rice, Santissima, Stocker, J. A. Gillis, Wilson & Means, Pine Tree, Last Chance, and other claims on Jackass Hill, near Tuttletown, are in the amphibolite schist east of the Mother Lode. They have been known in the past principally as pocket mines, and most of them were worked only to shallow depths.

In 1922 the group was taken under option by Nevada Wonder Mining Company. On the *Chileno* claim a shaft was sunk to a depth of about 500 feet on an incline of 74° and levels were run at 150 and 450 feet deep. On the 150-ft. level an ore shoot 160 feet long and of good grade was opened. On the 450-ft. level, over 1000 feet of work was done, of which over 500 feet was crosscutting, but results on that level were disappointing, and the option was abandoned.

The *Chileno* was immediately taken under lease and option by L. L. Coffer and G. L. Warrington, who in March, 1923, put in a Huntington mill. Mark Twain Mining Company was organized soon afterward to work the *Chileno*. They ran a level at 230 feet in depth and put up a 5-stamp mill with two concentrators. Some ore was stoped between the 230- and 150-ft. levels, and they extended the 450-ft. level, but had suspended work here when the property was visited November 30, 1927, and were prospecting the nearby *Atlas* claim.

The *Chileno* vein is a stringer lead of quartz and calcite in highly silicified amphibolite schist, with considerable pyrite often in coarse crystal form.

Clio Mine is on the Mother Lode one-half mile south of Jacksonville. Since the Seventeenth Report of the State Mineralogist, written in 1920, there have been many changes at the property. Late in 1922, the mill and surface plant burned down. A 10-stamp mill with three

Wilfley concentrators and a new Vandercrook mercurie cyanide plant of 50 tons capacity have been erected since. Work was formerly carried on through an adit, from which an interior shaft was sunk. The shaft has been raised 205 feet to the surface, and has also been sunk 300 feet and the 700-, 800-, and 900-ft. levels have been opened. The original property, which was a narrow strip along the lode, has been enlarged by the purchase of the Imperial Gold Mines, Bell Boy and West Clio claims and E. R. Bolton property, making a total of 637½ acres. There has been considerable exploratory work from the 600-ft. level down, but comparatively little ore has been milled by the present company.

The shaft is 930 feet deep, on an incline of 67° and has three compartments. Levels are at 218, 306, 361, 473, 565, 700, 800 and 900 feet. There has been a total of 1100 feet of drifting on 218 (adit) level, and 350 feet of drifting on 473-ft. level, of which 200 feet is caved. Of 480 feet of drifting on the 565-ft. level, 200 feet is new work. The 700-ft. level is drifted 300 feet, the 800-ft. level, 225 feet and 900-ft. level has been crosseted for 313 feet east.

The vein consists of quartz stringers and altered amphibolite schist, now a dolomitic sulphide ore, carrying 3% to 5% of pyrite. It has a maximum width of 40 feet but averages 8 to 10 feet. The foot-wall is swelling serpentine with a heavy gouge and the hanging wall is the altered amphibolite schist. The ore is generally low grade, running from \$4 to \$6 a ton, with low grade concentrate. The property was idle the latter half of 1927, but resumption of work was planned. The deepest stoping was for a length of 160 feet and width of eight feet on the 800-ft. level.

Crystalline Mine, on the Mother Lode north of the Harvard and a mile west of Jamestown, was unwatered and prospected in 1922 and 1923 by Tonopah Mining Company of Nevada. The steam hoist was converted to use electric power and a new headframe was built. The old workings had included a shaft 600 feet deep and levels at 283 and 593 feet, with considerable drifting. Tonopah Mining Company drove the lower level north along the course of the lode the entire length of the property, and to a point beneath the old Alabama shaft. Their option was abandoned late in 1923.

The claims are along the contact of serpentine and Calaveras (Carboniferous) schist and there has been widely dispersed alteration and feeble mineralization.

Dutch-App Group comprises Dutch and Sweeney Mines and mill-sites, App and Heslep Mines and millsites and Hitchcock Mine, in Secs. 22, 23 T. 1 N., R. 14 E., at Quartz Mountain two miles south of Jamestown. In January, 1928, they were advertised for sale under a deed of trust held by Wells Fargo Bank-Union Trust Company of San Francisco.

The App Mine was worked from 1856 until about 1890, when a depth of 800 feet had been reached, and again from 1893 at intervals until 1911 when another shaft had reached an inclined depth of 1340 feet. From 1915 until 1920 it was prospected and some ore taken out through the lower levels of the adjacent Dutch shaft. The early operations were on a small scale and contemporaneous reports stated that for 12 years the ore averaged \$14 a ton. In later years, there was a

60-stamp mill and ore was stoped for a width of 30 feet or more. This was on the footwall vein on the west side of the 'bull quartz' vein. The production of the App is reported to have been about \$6,500,000. The ore as mined in the later operations was low grade. Levels were opened at intervals of 100 feet from the new shaft and drifts were run north, the maximum distance being 1240 feet on the 1300-ft. level.

The Heslep Mine was worked previous to 1912 through a shaft 500 feet deep. In that year a cave occurred and 300 feet on the north end was lost. In 1923, J. A. Keyes and associate obtained a lease on the part of the mine above the 300-ft. level. They installed 12 stamps and milled ore for about two years, and are believed to have made a good profit. The Heslep vein outcrop was well defined but in depth it broke into stringers and bunches of quartz. The later work by Keyes was on an ore-shoot reported 260 feet long by six feet wide in the Whitford vein, lying between the Heslep and 'bull quartz' veins.

The Dutch Mine was worked at intervals from early days, and on a small scale. In 1893, larger scale operations were started and continued, with a few short interruptions, until April, 1920. The principal operations were carried on by Dutch Consolidated Mining Company, followed by Dutch-Sweeney Mining Company and finally by Pacific Coast Gold Mines Corporation. The Dutch shaft was sunk to a depth of 1867 feet by the first two companies and most of the production was made by them. The ore was low grade, on the average. A total of 646,000 tons is stated to have yielded \$2,500,000, but the entire output is not known. The operations up to 1915 were carried on at low cost, the total operating cost being as low as \$2.30 a ton, but costs more than doubled in the period 1915 to 1920 under the last named company. That company sank the Dutch shaft from 1867 to 2350 feet inclined (2070 feet vertical) depth and did about 17,000 feet of new development and exploration work on the App and Heslep veins, on the 1350, 1500, 1650, 2050 and 2300-ft. levels. The 1500-ft. level was the principal one, and was extended 1800 feet. Ore was mined and milled from the 1500, 2050 and 2300-ft levels. The levels were run into the App and Heslep claims south of the Dutch.

The Mother Lode, as it passes through this group of claims, consists of a series of veins with a total width varying from 40 feet on the north to 300 feet at the south, forming at Quartz Mountain the central part of a hill 250 feet high. The lode system is composed of quartz lenses and stringers, included fragments of wall rock, serpentine, dikes, mariposite and ankerite. The various veins in the system are: West, App or Footwall, Middle, Heslep, Whitford (in Heslep claim), Bull Quartz, and Knox & Boyle veins. The various veins may pinch and form lenses or break into stringers, and are not all continuous throughout the group of claims. The App (footwall) vein was principally worked in that mine, the Heslep and Whitford in the Heslep Mine, and the App, Middle and Heslep veins in the Dutch. The lode lies in the Calaveras (Carboniferous) slaty schists with altered greenstone (meta-andesite) and serpentine on the footwall and amphibolite schist on the hanging wall.

The ore in later operations was in the form of stringer leads and mineralized schist. The Middle and Heslep veins come within five to ten feet of each other above the 1500-ft. level, and in the App working were stoped together, 30 to 40 feet wide. In the Dutch, between

600 and 800 feet in depth, ore was stoped 60 feet wide and 250 feet long. Ore shoots are said to have crossed the lode diagonally from the footwall to hanging wall and pitched north. The schist ore handled by the last company gave 8% to 10% of concentrate, worth \$40 a ton. Ore shoots 10 to 15 feet wide and 200 to 300 feet long were mined. The general average of ore developed and mined by Pacific Coast Gold Mines Corporation was about \$5 a ton, but assays varied from \$1 to \$11 a ton. This company erected a costly reduction plant and mined and milled ore at the rate of 3500 tons a month for some time.

The ore treatment was as follows when the mill was visited when in operation late in 1919: Ore from shaft bins was broken to 3-inch size in gyratory crusher under the bins, and conveyed to mill bins from which it was fed to two Hardinge mills, grinding to 80 mesh. Pulp passed over plates to amalgamate any coarse free gold; classified, fines elevated and sent over two sets of three plates each, for further amalgamation of gold, then sent to a 16-cell Minerals Separation flotation machine. Flotation concentrate from first eight cells was cleaned on two Wilfley tables and from last eight cells was returned to first eight cells. Flotation tailing was sent to a K. and K. flotation machine, from which the concentrate went to a Dorr thickener, diaphragm pump and Oliver filter and was mixed with the concentrate from Wilfley tables for shipment. For flotation, a mixture of pine oil, water-gas tar, stove oil and beechwood creosote was used. A recovery of 90% to 92% was claimed.

The cost of operation was too high to permit a profit on the grade of ore developed, and as costs did not decrease after the war as anticipated, and as the expected gold bonus legislation was not enacted, work was stopped.

Eagle Shawmut Mine, on the Mother Lode near Jacksonville, has been the principal gold producer of the county in recent years. The mine and mill have been described in considerable detail in our past reports (Report XVII, page 479, and Report XVIII, pages 748-750). Belmont Shawmut Mining Company, lessee of the property for many years, quit work in November, 1923, and turned the mine back to the owners in June, 1924. It was subsequently sold to J. D. McCarty who is engaged in milling pillars and other small lots of ore, with the prospect of a complete shut-down soon. The Belmont Shawmut Mining Company mined a large tonnage of ore and tried various methods of milling but the increase of costs during and after the war absorbed all the profits that would have been possible under former conditions on such low and medium-grade ore. The total production of the property has been over \$5,000,000.

The ore deposit at this mine occurs in a broad fracture zone which is filled with quartz stringers and dolomite on the hanging wall of a dike which is composed principally of basic feldspars and is coarsely crystalline. The ore here is always accompanied by a massive outcrop of 'bull quartz.'

The ore bearing formations at the surface are at the east side of the complex of Mariposa (Jurassic) rocks, consisting of slate beds, often closely folded and intruded by many small dikes, some showing at the surface in the axes of the folds of slate. The ore lies close to the

contact of the Mariposa beds with a strip of Calaveras formation which is scarcely 100 feet wide at the south end of the property and consists of black and brown slaty-schist, with small lenses of limestone followed on the east by amphibolite schist.

Four types of ore were distinguished by O. McCraney in the later work. They were banded quartz, impregnated schist, dark and light sulphide ores. The principal ore in depth was the dolomite-sulphide ore, occurring in well-defined overlapping lenses 8 feet to 30 feet wide. The vein rolls, and the ore was in the crests of the anticlines. The sulphide content averaged 7%, and was even higher in the dolomite-sulphide ore, which was first encountered on the 17th level, and which became so important a part of the output from there down as to influence the method of treatment. There is a heavy gouge on the footwall side of vein which is six feet wide at the surface and is in contact with the vein between 1100 and 1400 feet in depth, but below is separated from the vein. Where cut in the workings it swelled excessively. Typical cross-sections of the formation at No. 3 and No. 18 levels showed practically the same sequence, with the 'bull quartz' or 'tale' on the footwall followed going toward the hanging wall by dolomite six to eight feet wide, assaying high in gold, at times, but generally low or medium grade, then a stratum of limestone, three to 11 feet wide, which is separated from the amphibolite schist of the hanging wall by 15 feet of black slate (Calaveras formation). Stopes were generally not over 200 feet long. Faults across the course of the lode bound the deposit on both ends, displacing the vein from east to west, looking south; but no important orebodies have been found on either adjoining property. The ore generally averaged from \$4 to \$4.50 a ton in later years, though at many times better grades were mined, and in the earlier operations ore rich in free gold was found.

The mine was worked through three inclined shafts, the deepest an internal shaft, with an inclined depth of 3213 feet at the 21st level. Later work was through this shaft, reached through a crosscut tunnel 1060 feet long, 450 feet on the dip below outcrop. This shaft was on the vein at an angle of 65° to 68° to between the 11th and 12th levels, then on an angle of 65°, entering the hanging wall and being about 100 feet from the vein on the lower levels. These levels were numbered 16 to 21 and were 200 feet apart. About six miles of drifts were run, most of them north of the shaft.

Many systems of ore reduction have been used at this mine. At first, regulation stamp-milling and plate amalgamation were used. Then a chlorination plant was installed and operated until the Belmont Shawmut Mining Company took the property. The percentage of sulphides (principally pyrite) increased with depth and the proportion of free gold that could be amalgamated decreased. This company installed Jones-Belmont flotation cells and made two grades of concentrate, one on the vanners and one with the cells. These at first were shipped for smelting, but they were usually low grade and shipment and smelter charges were high and smelter specifications quite exacting, so that experiments were carried on to find the best way of extracting the gold at the property.

In the course of this work, it was found that the oil-floated concentrate responded better to cyanide treatment than the table concentrate.

Extended use of the flotation cells also showed that while flotation gave a satisfactory recovery, it was more expensive than the grade of ore justified. The flotation cells were therefore discarded. Sixty stamps were used to crush ore to 18-mesh without amalgamation in batteries or on plates. The pulp was first concentrated on 8 Butchart tables. Table tailing was sent through a Dorr thickener and the thickened feed was concentrated on 16 Frue vanners. The original concentrate from the Butchart tables and the concentrate from the Frue vanners were then ground to minus 200-mesh in a 5 ft. by 18 ft. tube mill to which 8 lb. to 10 lb. of California crude oil was added, per ton of concentrate. The finely ground concentrate was then thickened and cyanided in six 14 ft. by 14 ft. Devereux agitators, and solution sent to precipitation tanks. No battery nor plate amalgamation of gold was considered necessary as the free gold in the sulphide ore was small in amount and finely divided.

Experimental Mine is a mile and a half north of Columbia on the south side of North Fork of Stanislaus River. There are three unpatented lode claims, a mills site and a patented placer claim, giving 2000 feet along the strike. The present stock company, a Nevada corporation called Experimental Mining Company, which has the property under lease and option, has consolidated with it the John Royal quartz claim, adjoining.

The vein was discovered six feet below the surface in the course of placer mining. The first mill, of eight stamps with square wooden stems, was built in 1854. The vein was worked intermittently from 1854 to 1904 and since 1904 the property has been active on a small scale most of the time.

The strike of vein is N. 20° W. and it dips 40° E. The hanging wall is hard dolomitic limestone full of caverns, many of which contain water and mud, and the footwall is limestone and a series of decomposed dioritic dikes, which strike across the course of vein and dip steeply. Ore shoots appear to make at the junctions of these dikes with the vein. The average width of vein in the ore shoots is $2\frac{1}{2}$ to $3\frac{1}{2}$ feet and it is reported to maintain this width in the bottom. The rich ore near the surface was free gold associated with azurite; in depth, it carries free gold, pyrite, galena and chalcopyrite.

The shaft was nearly 400 feet deep, on the dip of vein, with six levels, previous to 1924. A drain tunnel had also been run as a cross-cut 2800 feet, and although it was still 300 feet from the vein, it had drained the workings to within 75 feet of the bottom because of the cavernous nature of the limestone. No figure of the total production can be obtained, but Thomas Conlin states that in four seasons (using water power, which was available only part of the year) \$55,000 was produced. This was between 1906 and 1909. Since then to 1921, the output paid expenses. In April, 1924, United Mines Company of California (M. M. Van Wyck in control) began work. The drain tunnel was cleared and extended, cutting the Shaft and Cellar ore shoots and extending 100 feet south of the shaft bottom. These ore shoots proved disappointing on this level. A winze was sunk 100 feet on the Cellar shoot and drifts were run, opening the vein for 120 feet. This gave such encouraging results that electric power was brought in

and a good hoist and compressor installed. The winze was sunk 86 feet deeper, and a second level started at a depth of 150 feet. The total output from these winze workings, most of it from the first 100 feet of winze and the first level, was \$43,850. This company also connected the drain tunnel level with the old shaft workings 230 feet above. They quit in November, 1926, and other lessees continued work until July, 1927. Another winze was sunk 60 feet deep from the drain tunnel on the shaft ore shoot, which is 300 feet north of the Cellar shoot. The reported output of this work was \$11,000 of which \$10,000 came from the second winze workings, where a drift and raise were each run 40 feet. In July, 1927, the hoist and compressor were removed, but the present lessees have lately begun work with 15 men and are deepening the Cellar winze. Considerable water has been encountered in sinking this.

There is a 5-stamp mill and other equipment at the tunnel portal and a 3-stamp mill and old water-power hoist at the shaft collar.

Garfield prospect is east of the Grizzly and north of the Starr King and is about two miles from Tuolumne. It was worked up to 1914 by adits, producing about 800 tons of \$7 ore from above an adit which reached a depth of 75 feet below the outcrop. Other adits were also driven. In 1917 or 1918, a shaft was sunk 250 feet below the former adit level and a drift was run 1200 feet on the fissure, which there carried about one foot of gouge, reported to assay \$4 a ton. One adit was also run 800 feet. No payable ore was developed in either case. The Garfield claim is patented and three unpatented claims were held also. There is a mill of ten 1050-lb. stamps.

Harriman Mine. Harriman Mining and Milling Company, owners, 1106 Tribune Tower, Oakland. L. A. Lessman, president; L. W. Jefferson, secretary-treasurer.

It is on the Mother Lode a mile and a half south of Jacksonville. It contains three patented claims, named M. B., Sonora and Hayes, and the Willieta claim is under option, giving a total length of about a mile. At this place, the Mariposa slates are only about 1500 feet in width and are flanked on the east by serpentine and the Calaveras formation with intrusive dikes of diabase. The principal workings are at the contact with serpentine on the footwall.

There are two shafts, both on the M. B. claim. No. 1 or north shaft is 500 feet deep on 61° incline, with levels at 200, 350 and 500 feet inclined depth. This shaft has two compartments to 350 feet in depth and the balance has three compartments. Drifts have been run 280 feet south and 150 feet north on the 350-ft. level. The south drift is on the vein, averaging probably eight feet wide, one crosscut showing 35 feet in width which is reported to average \$4 a ton. This ore shoot is believed to be 100 feet long. It has a soft, black serpentine footwall and a hard diabase hanging wall which has been crossecut for 70 feet. The south drift on the 200-ft. level is 570 feet long, connecting with No. 2 shaft. The 500-ft. level was still under water and inaccessible at time of visit in October, 1927. The entire mineralized formation at the property is 180 feet wide, of which the portion next the serpentine is the footwall or 'bull quartz' vein. In the south shaft workings at 120-ft. level, which were open in 1921, the diabase dike and

later grey dikes run parallel. A zone of stringers in the diabase carried free gold where they ran to and were cut off by the grey dikes. The amount of such ore was small. A crosscut was run on that level 116 feet east into the footwall.

George Z. Bertschy, the present superintendent, reports finding a good prospect on the Sonora claim a little east of the No. 1 shaft and will crosscut from the 500-ft. level to see if this extends to that level. The prospect is on the hanging wall of the diabase.

The property is equipped with electric hoist, air compressor (340 cu. ft. free air p. m.) and 10-stamp Straub mill and one concentrator. The mill capacity is $12\frac{1}{2}$ tons daily to 35 mesh.

Harvard Mine is a mile southwest of Jamestown on the Mother Lode. It was discovered in 1850 and worked at intervals until October, 1917, since which time the mill and hoist have been dismantled and the mine has lain idle. The property comprises the McCann, Mooney, Trio and Sobrante mining claims and Mooney millsite, and covers about 5000 feet. The Trio and Mooney claims, when worked at shallow depths in the early days, produced ore carrying about \$4.75 a ton, and the bulk of ore produced has been low grade, although one narrow vein at the serpentine contact in the south workings produced a small amount of very rich ore.

The lode here has a serpentine footwall and Calaveras slate and schist hanging wall. Most of the ore in later operations was mineralized schist and stringers of quartz cutting the schist. Several ore shoots averaging 200 feet long by six feet wide were worked up to the time of the war. An operating cost of about \$2 a ton was claimed in 1914 with 60 stamps crushing about 300 tons of ore daily, and with a total crew of 115 men. After the war started, costs rose and higher grade ore had to be sought. Shortly before closing, ore of fair grade was developed on the north on the 1850-ft. level, but at quite a distance from the shaft, and apparently did not offer sufficient incentive to continue operation.

The mine was opened through two shafts 1000 feet part. No. 1, the north shaft, was 700 feet deep and No. 2, the main working shaft in later years, was perpendicular for 700 feet, then on an incline of 58° to a depth of 1850 feet. Levels were run at intervals of 150 feet in the lower part of the mine.

Usual Mother Lode practice was followed in milling. The stamps weighed 1200 lb. each and crushed ore to pass either 40-mesh or 20-mesh screen. Concentrate was saved on Johnson vanners. It was low grade, running \$30 to \$35 a ton, and consisting almost entirely of pyrite. The recovery was 85% to 90% of mill head assay value. The total reported output of the mine was about \$2,500,000.

Lucky Strike Prospect. J. D. Thomas, Confidence, et al., owners. There are six claims on the east side of North Fork of Tuolumne River three miles by steep road from Confidence. Lucky Strike claim is the site of most of the work done.

There is an adit 120 feet long on a vein striking N. 35° to N. 60° E. and dipping 83° NW. It has a maximum width of $4\frac{1}{2}$ feet. A winze 10 feet deep is sunk at the face of adit. A short distance west an inclined shaft has been sunk 50 feet and a level run 70 feet (now under

water) on a flat vein crossing the other. The first mentioned vein is white quartz carrying patches of zincblende, pyrite and a little galena. It looks promising but assays so far have varied from \$1 to \$7.90 a ton. The second vein is a small one showing some pyrite. There is a small hoist at the shaft with two auto engines for power.

On the adjoining hillside on these claims there are several other veins in the granodiorite. Some of these pan well in gold, but have not been prospected.

Mayflower Prospect contains three unpatented claims two miles southeast of Confidence on the west side of the canyon of North Fork of Tuolumne River. W. T. Barrett, Confidence, is the owner and California Barrett Gold Mining Company, Oakland, has a lease and option to purchase.

There is an old drift 74 feet long on the vein, a crosscut of 30 feet and a winze 12 feet on a vein striking northeast reported 40 inches wide, but this is partly inaccessible. At a point 100 feet lower vertically and at an elevation of 3080 feet, an adit had been run 140 feet at time of visit, crossecutting toward the vein. The country rock is granodiorite, and where the adit runs there has been a partial differentiation of the lighter minerals, especially quartz, but it shows considerable hornblende near the face, and a small quartz vein, so far unprospected. It was not expected to cut the vein found above for about 100 feet farther.

There is a 16-h.p. gas engine and 8" by 6" vertical compressor at the lower adit. Two men are employed.

Morning Glory Mine is 2.7 miles by steep road from Confidence, and at an elevation of 3010 feet just east of North Fork of Tuolumne River. C. Layman and J. A. King are working it. There are five claims in the property, but most of the work is on the Morning Glory claim.

The vein strikes N. 20° W. and dips about 24° east. It varies from six inches to two feet wide and carries galena, pyrite and free gold in ribbon quartz. In the mine workings it is enclosed in a greenish dike which intrudes the granodiorite country rock.

A shaft follows the vein on its dip for 140 feet in the hard dike rock. Drifts have been run short distances north and south from the shaft, but only a small tonnage has been mined and milled. There is a compressor and a small pump, operated by water power.

Phoenix Mine. Owner, Phoenix Mining Company. B. A. Whittaker, president, Tuolumne. It comprises two claims, the Phoenix and Central, three miles southeast of Tuolumne near the Providence mine. The claims cover 1500 feet in length on the vein.

The company began work in 1921 and was incorporated in 1924. They claim to have spent \$22,000 in development work. An inclined shaft has been sunk and levels were turned at 170 and 265 feet inclined depth. The first level was drifted 165 feet south and the second 411 feet south and 80 feet north. In the latter, it is claimed that the vein averages six to eight feet wide and shows payable ore for 220 feet as proved in four winzes, but this could not be checked as the property is idle and workings could not be visited. The company is seeking further funds to deepen the shaft and open another level.

Providence Mine is $2\frac{1}{2}$ miles southeast of Tuolumne. It was worked on a small scale prior to 1896 and was described in the Fourteenth Report of the State Mineralogist. It was one of the large producers of the East Belt, but has lain idle since 1917, the principal period of production having been between 1897 and 1908.

It was worked through an inclined shaft 1300 feet deep on an incline of 45° and the vein was drifted for a maximum distance of 1050 feet to the 1100-ft. level, the larger part of work being north of the shaft. The ore shoots opened on the hanging wall vein were stoped from the 1100-ft. level to the 700-ft. level, and on the footwall vein ore was stoped from the 700-ft. level to the surface. In the later operations, ore is reported to have been worth \$10 to \$15 a ton. It is on the Eureka-Dead Horse lode and carried free gold, pyrite and galena. A 10-stamp mill was operated. The reported gross production was \$700,000.

Starr King Mine is two miles in an air-line or seven miles by road from Tuolumne and contains the Starr King and Sherman patented claims, the American (unpatented) and a millsite. The first two were worked from early days. From 1886 until 1906 the Sherman Mining Company operated them. The Starr King Development Company put up a 5-stamp mill in 1906 which burned down after running three days. It then lay idle until 1911, when it was purchased by R. C. Kennedy, who put up a new 5-stamp mill and other machinery and worked it until the end of 1916, since when the Starr King Mine, Inc., was formed but has done little, if any, work. A total production of \$100,000 has been claimed, during 30 years of occasional small operations.

The vein occurs in the Calaveras formations (Carboniferous) composed of slate and mica schist with dikes and some limestone. The strike is generally north and dip 30° to 50° east and the ore formation is irregular and richest at the junctions of joints. The shaft is 510 feet deep, following the vein at an angle of 30° to 60° and the vein has been explored for 400 feet along the strike, with five levels, most of the drifting being north of the shaft. The vein varies in width from a narrow seam to 36 inches. The only reliable way to determine the value of ore is said to be by mill runs.

According to a report by Robert Hawhurst, Jr., a mill run of 100 tons gave an average of \$8.67 a ton on the plates and a loss of \$2.30 a ton in the tailing, from three ore shoots, one south and two north of the shaft. Another mill test by Alexander Hamilton indicated \$25.40 a ton from ore taken out on the 500-ft. level.

The property is equipped with five 1150-lb. stamps, one concentrator, a 25-h.p. electric hoist, compressor, tools and necessary buildings with accommodations for a crew of 10 men.

United Mines (Grizzly, Lady Washington, Dead Horse, Eureka, New Albany). The holdings consist of nine patented claims. The last regular milling operations were in 1914, when the New Albany vein, east of and parallel to the Dead Horse vein, was being worked. The workings on these claims were extensive, including the Dead Horse shaft reported 2100 feet deep on an incline of 50° , New Albany shaft 1020 feet deep on the incline, Grizzly shaft 1000 feet deep, and Lady Washington adit, 3300 feet long. This adit was a crosscut for 2400

feet, cutting the Dead Horse vein at an inclined depth of 1165 feet and thence running as a drift on the vein for over 900 feet northwest. The last work, in 1919-1921, was done by the Grizzly Mining Company and consisted of extending the last-named adit level along the vein, also in sinking the Dead Horse shaft 300 feet and crosscutting 180 feet in a search for ore, which was unsuccessful. The Dead Horse vein was stoped to the 1400-ft. level and the New Albany from 700-ft. level to surface.

The veins occur in the contact zone between the Calaveras mica schist on east and granodiorite on west, but both walls of the Dead Horse vein are granodiorite in the later workings to the northwest. The footwall schist near the vein was soft and black. This vein was one to five feet wide and three ore shoots were worked, the best ore being reported where a granodiorite dike came in contact with the vein. It is said this contact seldom extended for more than 60 feet at a time, but these old workings were inaccessible when the mine was visited during the last operations.

Two ore shoots were worked in the New Albany, where the ore is reported at the intersection of cross diorite dikes with the vein. The ore in both properties was of good grade carrying coarse and fine free gold and $1\frac{1}{2}$ to 2% sulphides averaging \$70 a ton in value. The principal operations were under the control of Alvinza Hayward, who never gave out information about the results obtained, but the estimated production of the Dead Horse-Eureka group was \$1,500,000 and of the New Albany, \$200,000.

Wise Claim adjoins the Chileno on Jackass Hill. It is being worked by S. J. Davies, one of the owners, who mines and crushes small lots of ore. It is developed by two adits, 100 feet and 600 feet long, respectively, on the stringers and small veins in the amphibolite schist, characteristic of this district. Davies lately put up a mill of three 600-lb. stamps for which power is furnished by a Ford automobile engine. The mill has no rock breaker nor concentrator, and crushes two tons in eight hours through 40-mesh screen.

SACRAMENTO FIELD DIVISION

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Badger.....	13	1 N.	14 E.	Badger Qtz. Mine, c/o Alvin I. Ellis, 558-11th Ave. San Francisco	21
Baer.....	{	31	2 N.	{ 15 E. J. E. Baer, Sonora	8
Badger.....	{	31	2 N.	14 E.	XII, p. 474.
Badger.....	{	18	1 N.	14 E.	XI, pp. 508-509; XIII, p. 474.
Bald Mountain.....		25	2 N.	14 E.	Badger Qtz. Mine, c/o Catherine A. Ellis, 480 10th Ave., San Francisco
Banner.....		29	1 S.	16 E.	Heirs of Birney and Monroe, c/o L. Fontana, 1015 No. Center St., Stockton
Brockwith & Saunders.....		36	2 N.	12 E.	Chas. Harper, C. E. Watson, Big Oak Flat.....
Belcher.....		30, 31	2 N.	14 E.	3000
Bell.....		11, 12	1 S.	15 E.	XIII, p. 474.
Bellevue.....		25	2 N.	14 E.	XIV, p. 138; XV, p. 138.
Belmont-Shawmut.....		29, 32	1 S.	16 E.	See Hyde.
Belmont.....		25	2 N.	14 E.	XVII, pp. 479-481; XVIII, pp. 99, 748- 750; XIX, p. 19; Pre. Rep. No. 8, p. 39; XX, p. 19.
Benjamin Harrison.....		7	1 S.	15 E.	XIV, p. 138; XX, p. 19.
Bicknell.....		30	1 S.	16 E.	XIII, p. 474.
Big Bonanza.....		18	1 S.	15 E.	2000
Big Casino.....		35	2 N.	15 E.	XVII, pp. 479-481; XVIII, pp. 99, 748- 750; XIX, p. 19; Pre. Rep. No. 8, p. 39; XX, p. 19.
Big Chunk.....		21, 28	1 S.	15 E.	XIV, p. 138; XX, p. 19.
Big Oak Flat No. 1.....		18	1 S.	15 E.	XIII, p. 474.
Birney.....		36	2 N.	15 E.	See Hammillfield.
Blackfoot & Slide Hill.....		21	1 S.	15 E.	36
Black Hawk.....		21, 28	1 S.	15 E.	XIV, p. 138.
Black Hawk.....		1	1 N.	15 E.	2000
Black Oak, Live Oak, White Oak, Carr.....	{	36	2 N.	15 E.	XIV, p. 138.
Blue Eagle.....		3, 4	1 S.	18 E.	2850
Bluehead.....		28	2 N.	16 E.	VIII, pp. 663-666; X, pp. 744-746; XI, p. 501; XII, p. 299; XIII, p. 474; XIV, pp. 138-140; Bull. 18, pp. 137-138.
Blue & White Star.....		31	1 N.	16 E.	Field Report.
Boitano.....		18	1 S.	16 E.	XIV, p. 140.
Boitano Ranch.....		Big	Oak	Flat	XIV, p. 140.
					XIV, p. 140; XVII, p. 485.
					Meyer, 329 St. Chas. St., Elgin, Ill.

*Due to various legal complications which may arise regarding ownership of mining claims, we do not vouch for absolute correctness of this column. The names are mostly those appearing on the tax rolls. To save space, frequently only one of several owners is listed.

TABLE OF QUARTZ MINES AND PROSPECTS, TUOLUMNE COUNTY—Continued.

Name of mine	Location			Owner's name and address*	Eleva- tion, feet	Area, acres	Bibliography
	Sec.	Twp.	Range				
Bonanza-----	36	2 N.	14 E.	Roscoe Oliver, Sonora-----	1800	14	VIII, pp. 652-654; IX, p. 37; X, p. 736; XI, pp. 511-513; XII, pp. 299-300; XIII, p. 475; XIV, p. 141; XVII, p. 99; Pre. Rep. 8, p. 39.
Bonita-----	9	1 N.	16 E.	Wm. Angus & Chas. Neal, c/o G. L. Breese & Co., Kohl Bdg., San Francisco-----	11	11	XIII, p. 475; XIV, p. 140; XVII, p. 485. See Philadelphia
Boston-----	29	1 S.	16 E.	Henry F. Heiden, Groveland-----	-----	-----	XIV, p. 141; Bull. 18, p. 129.
Bourne-----	25	2 N.	13 E.	R. Minor, 1105 Sherman St., Alameda-----	-----	-----	-----
Brecknell-----	29, 31	1 S.	16 E.	Mrs. E. Raggio, Big Oak Flat-----	20	20	-----
Brown Bird-----	2	1 S.	14 E.	Wm. G. Fitzgerald, Jamestown-----	-----	-----	-----
Buchanan & Lookout-----	26, 27	1 N.	16 E.	Mrs. Alfred Davis Wright, 648 Taylor Ave., Alameda-----	3000	20	VIII, pp. 666-669; X, pp. 732-735; XI, pp. 492-496; XII, p. 300; XIII, p. 475; XIV, p. 141.
Buckeye-----	-----	-----	-----	-----	-----	-----	See Seminole.
Buckhorn-----	29, 31	2 N.	14 E.	Mrs. M. R. Clement, 422 Pacific Ave., Piedmont-----	-----	-----	XVII, p. 485; Pre. Rep. 8, p. 39.
Buena Vista-----	22	1 S.	15 E.	Mary Ferretti, c/o Mrs. Eugenia Hughes, Chinese Camp-----	22	22	-----
Buona Speranza-----	-----	-----	-----	Vivian and Gerloch, Sonora-----	-----	-----	-----
Buzzard's Roost-----	10, 15	1 N.	14 E.	Jamestown Exploration Co., 32 California St., Stockton-----	1200	22	XI, p. 506; XIII, p. 475; XIV, p. 141 XIII, p. 475
Cardinelle-----	5	1 N.	16 E.	Carlotta G. Mining Co., c/o T. P. Sullivan, 176 Haight St., San Francisco-----	2600	35	XI, p. 499; XII, p. 300; XIII, p. 475;
Carlin-----	32	2 N.	16 E.	-----	-----	-----	XIII, p. 475.
Carlotta Cons.-----	{	-----	-----	-----	-----	-----	XIII, p. 475.
Carmelita-----	-----	-----	-----	-----	-----	-----	X, p. 748.
Carrie-----	-----	-----	-----	-----	-----	-----	-----
Cary-----	-----	-----	-----	-----	-----	-----	-----
Casa Madera (18 unpat. claims also)-----	24, 13	2 N.	16 E.	Casa Madera G. Mining Syndicate, Humboldt Bank Bldg., San Francisco-----	-----	-----	XIX, p. 144; XX, pp. 19-20.
Central-----	32	2 N.	16 E.	J. & P. Grazioli, Tuolumne Mrs. A. Cumming, c/o D. W. Cumming, 2028 Burbeck, Ave., Richmond-----	-----	11	-----
Champion-----	30	1 S.	-----	-----	-----	20	-----

SACRAMENTO FIELD DIVISION

Chance	21	1 S.	15 E.	R. H. Goodwin, 579-25th St., Oakland	17
Chantreau	7	1 N.	14 E.	F. W. Street, Mrs. M. J. Hagman et al., c/o Mrs. M.	12
Chaparral	{ 26, 27	1 N.	16 E.	J. Hagman, Jamestown	21
Chileno	{ 35 30	1 N. 2 N.	16 E. 14 E.	{ F. A. Wenzel, Sonora Mark Twain Mining Co., a corp., 511 Bank of Italy Bldg., Oakland	XI, p. 496; XII, p. 300; XIII, p. 475; XIV, p. 142.
Chimney Rock					XIII, pp. 482-483; XIV, p. 142; XVIII, pp. 99-100; XIX, pp. 19, 144-145; Bull. 18, p. 129.
Chlorinda	29	1 S.	16 E.	Chas. F. Harper, Big Oak Flat	XI, p. 47; XIII, pp. 475-476; XIV, p. 142;
Clio & Jackson	18	1 S.	15 E.	Clio Vindicator Mining Co., Chinese Camp c/o H. Haeter	XVII, p. 481; XVIII, p. 100; XIX, p. 19; XX, p. 20, 182; Pre. Rep. 8, p. 39.
Clio					XIII, p. 476.
Cloudman				See Erin-go-bragh	XIII, p. 476.
Coffee-Mill					XIII, pp. 476, 483.
Colby	31, 32	2 N.	16 E.	J. J. Cade, c/o A. L. F. Warren, Tax Agt. Cherokee Mines Cons. Inc., 307 Park Bldg., Portland, Ore.	XII, p. 301; XIII, p. 476; XIV, p. 142.
Columbus				Tuolumne County Bank, c/o C. H. Segerstrom, Sonora	2600
Combination	32	2 N.	14 E.		45
Comstock					XIII, p. 476.
Confidence, Jessie, Edith, Independence, Confidence No. 2, 3-	10	2 N.	16 E.	George H. Sexton Estate, c/o A. E. Rome, 716 Call Bldg., San Francisco	2
Conlin & Graham					XIII, p. 476.
Conrad				Part of United Mines Group	XIII, p. 476.
Cons. Eureka					
Consuelo, Fair Play Cons. & Goodenough	{ 16, 9	1 N.	16 E.	{ Estate of Anna M. Bluett, c/o Ben F. Woolner, Atty., 1st Nat'l Bank Bldg., Oakland	70
Contact	{ 36	1 N.	16 E.	G. B. Musante, Big Oak Flat	XI, p. 503; XIII, p. 476; XIV, p. 142;
Contention	{ 31 16, 17	2 S. 1 S. 3 N.	15 E. 16 E. 15 E.	Franco Contention Mining Co., c/o C. O'Shea, Box 123, Jamestown	XVII, p. 482; Bull. 18, pp. 136-137
Cordova	28	2 N.	16 E.	Claire McNeely, c/o M. W. McIntosh, 114 Sansome St., San Francisco	XIII, p. 476; XII, p. 301; XIII, p. 476; Bull. VIII, pp. 664-665; XI, pp. 750-752; XII, p. 498; XII, p. 139.
					XII, p. 301; XIII, pp. 476-477; XIV, p. 143.

*Ownership shown in this table are those shown on assessment rolls.

TABLE OF QUARTZ MINES AND PROSPECTS, TUOLUMNE COUNTY—Continued.

Name of mine	Location			Owner's name and address*	Eleva- tion, feet	Area, acres	Bibliography
	Sec.	Twp.	Range				
Cornucopia No. 1, No. 2, New Eden, Eden No. 2, Mason	1	1 N.	15 E.	Black Oak South Ext. Mining Co., c/o James Mason, 430 California St., San Francisco	3125	39	XI, p. 494; XII, p. 301; XIII, p. 477;
Cosmopolite & Violet	29	1 S.	16 E.	M. C. Merrill, Groveland			XIV, p. 143.
Crown Point							XIII, p. 477.
Cross Cross & Relief							X, p. 742; XIII, pp. 477-479; XIV, p. 145; XX, p. 19.
Crystalline							XII, p. 301; XIII, p. 477; XIV, p. 143.
Darrow	25, 26	1 S.	16 E.	Saul Morris, 202 E. Adam St., Stockton	1500	31	VIII, pp. 664-665; X, p. 730-752; XI,
Dawn	9	1 N.	14 E.	Cecile Shafer, Jamestown		51	XIV, p. 143.
Dead Horse							XVIII, p. 99; XIX, pp. 19, 74,
Del Monte	5	1 N.	14 E.	J. H. Darrow, Jamestown			XIV, p. 143.
Densmore & Young American	1	1 N.	15 E.	J. J. & R. A. Nicholls, Soulsbyville			XVIII, p. 99; XIX, pp. 19, 74,
Densmore				Part of United Mines Group			XIV, p. 143.
Donella	21	1 S.	16 E.	Sierra Gold Mining Co., Arlington Heights, Illinois	2900	16	XIV, p. 143.
Donovan	4	2 N.	14 E.	Deansore Cons. Qtz. Mining Co., c/o Crittenden Hampton, Sonora	1000	40	XIV, pp. 143-144; Bull. 18, pp. 135-136.
Don Pedro							960 Pre. Rep. No. 8, p. 38.
Dorsey	11, 14	22 N.	9 E.	Ben Soulsby, c/o John B. Sivori, Tuolumne, et al.			XII, p. 304; XIII, p. 437; XX, p. 20.
Draper	22, 23	22 N.	9 E.				See Vulture.
Dreisam							XIII, p. 477.
Duffield							See Whitto.
Duleek No. 1, 2, 3	28	2 N.	16 E.	J. E. Conde, Arastraville, et al.	3300	40	XIV, p. 144; Bull. 18, p. 139.
Dundero	28	2 N.	16 E.	Andrew Seanavino, Tuolumne, et al.	3150	35	XIII, p. 477; XIV, p. 144.
Dutch	2	1 S.	16 E.	W. J. Graham, Box 247 St., George, Utah	2700	61	XIV, p. 144.
Eagle Shawmut	22, 23	1 N.	14 E.	Pacific Coast Gold Mines Corp., c/o C. H. Seerstrom, Sonora	1661	70	X, p. 51; XI, p. 509; XII, p. 302; XIII, p. 477; XIV, pp. 145-146; XVII, p. 1482; Bull. 18, p. 130.
East Lode	11, 12	1 S.	15 E.	J. D. McCarty, Milton	900	760	X, p. 48; XIII, p. 477; XIV, p. 146; XVII, p. 479; XVIII, pp. 99, 748-750; XIX, p. 19; XX, p. 188; Bull. 18, pp. 132-133.

*Ownerships shown in this table are those shown on assessment rolls.

TABLE OF QUARTZ MINES AND PROSPECTS, TUOLUMNE COUNTY—Continued.

Name of mine	Location			Owner's name and address*	Eleva- tion, feet	Area, acres	Bibliography
	Sec.	Twp.	Range				
Georgiana							
Gerrymander Cons.	1	1 N.	14 E.	Gerrymander Cons., Mining Co., c/o John J. McCarthy, Secretary, 365 Bush St., San Francisco	30		See Garfield.
Gladis	18	1 S.	15 E.	Now part of Clio			See Argall.
Gladstone							XI, p. 510; XIII, p. 478; XIV, p. 149.
Gloster							See Providence.
Godfrey							XIII, p. 479.
Gold But							XIII, p. 479.
Golden Crown							VIII, p. 675.
Golden Dam	35	2 N.	15 E.	R. A. Nichols, J. J. Nichols, Soulsbyville	2700		Field Report.
Golden Eagle	19	1 S.	16 E.	M. McCormick Co., 1432 No. El Dorado St., Stockton, c/o Andrew McCormick	2900		XIII, p. 479.
Golden Gate	1	1 N.	14 E.		1800		X, pp. 738-740; XI, p. 511; XII, p. 302; XIII, p. 479; XIV, p. 149; Bull. pp. 134-135.
Golden Poppy Mining Co.	17	1 S.	15 E.	Golden Poppy Mining Co., Inc., Freedburger-Blodgett Bldg., Lodi	153		
Golden Nugget	2	1 S.	14 E.	Maud Twiss, Tuolumne	19		
Gold Ridge Mining Co.	1, 2	1 S.	14 E.	c/o W. T. Jones, Jamestown	54		
Golden Rule				Part of Jumper			XIII, pp. 479-480.
Golden Rock							XIII, p. 479.
Golden Star	32	2 N.	14 E.		1125		XIII, p. 480.
Golden Treasure	7	2 N.	16 E.	Mary Marsciano, 781 Green St., San Francisco			See Hyde.
Golden West							XIII, p. 479.
Gold Hunter							See Merritt.
Gold Nugget	16	1 N.	16 E.		2000		Bull. 18, pp. 138-139.
Goldwin	24	2 N.	14 E.	Theodore Schoefer, Jr., Sacramento, $\frac{1}{2}$; Bill Petrovich, 1019 2d St., Sacramento, $\frac{1}{2}$, John Shano, Sonora, et al.			
Good Hope	24	2 N.	14 E.				14
Good Luck	24	2 N.	14 E.				
Good Luck, Ophir and Yellow Jacket Claims							Pacific Expl. Co., c/o W. B. Morris, 3016 E. 29th St., Oakland.
Good Luck M. & M. Co.	12	1 S.	14 E.				Good Luck Mining & M. Co., c/o Frank D. Doe, 16 California St., San Francisco.
Good Shepherd	18	2 N.	16 E.				XIII, p. 480. Garnett T. Barron, Soulsbyville.

Grass Extension-----	29, 30	2 N. 2 N.	14 E. 14 E.	Fred Sutton, Sonora A. W. Stinchfield & F. A. Mitchell, R. F. D. 1, Sonora-----	20
Grant-----	-	-	-	-	XIII, p. 480. See Santa Ysabel.
Gray Eagle-----	-	-	-	-	VIII, p. 67.5. See Mt. Vernon & Green Cons.
Great Sierra-----	-	-	-	-	
Green-----	-	-	-	-	
Grey Eagle & Rival-----	23, 24 9, 4	3 N. 1 N.	15 E. 16 E.	Frances Korbel et al., c/o P. Y. Lewis, Columbia Grizzly Mining Co., c/o Horace M. Street, 709 Hobart Bldg., San Francisco-----	2000
Gross Cons.-----	29, 30	2 N.	14 E.	Gross-Street Mining Co., c/o E. B. Cushman, 1024 Mills Building, San Francisco-----	130
Gross-----	29	3 N.	15 E.	F. G. Gross, c/o Mrs. L. E. Larson, 629 South East St., Stockton, California-----	12
Ham & Birney, Hart & Jacobs-----	4	2 N.	15 E.	Hamilton Mining Co., c/o H. M. A. Miller, Kohl Bldg., 341 Montgomery St., San Francisco-----	41
Hamilfield-----	-	-	-	See Ham & Birney-----	XIII, p. 480-481. XIII, p. 481.
Hancock-----	-	-	-	-	
Happy Jack-----	8 9, 10 19, 30	2 N. 2 N. 1 S.	16 E. 15 E. 15 E.	Mrs. C. Skaggs, 108 Liberty St., San Francisco----- Florence M. Davis, 521 Pacheco St., San Francisco----- Harriman G. Mining & Milling Co., c/o L. W. Jefferson, son, Tribune Tower, Oakland-----	20 30 900
Hawk, May, Hartman-----	14	2 N.	16 E.	Phoenix Lake G. Mining Co., c/o S. F. Milling Co., 7th and Berry Sts., San Francisco-----	55
Harris-----	-	-	-	-	54
Harvard-----	16	1 N.	14 E.	Thomas A. Ferguson, 615 Kohl Bldg., San Fran- cisco-----	See Crystalline.
Hayes-----	-	-	-	-	X, p. 53; XIII, pp. 485, 493; XIV, pp. 149-151, 164; Bull. 18, p. 130.
Hazel Dell-----	35, 36	3 N.	15 E.	Hales & Symons, Sonora-----	XIII, p. 481.
Hector-----	-	-	-	C. F. Fashan, Sonora-----	XII, p. 481.
Henrietta-----	-	-	-	See Dutch-----	XII, p. 302; XIII, p. 481; XIV, p. 152;
Heslep-----	22	1 N.	14 E.	-	VIII, p. 660; XII, p. 299; XIII, p. 473; XIV, p. 136; XIX, p. 144; XX, p. 20.
Hibbing-----	-	-	-	-	XIII, p. 481.
Hidden Treasure-----	-	-	-	-	XIII, p. 481; XVIII, p. 101.
Hitchcock-----	-	-	-	-	See App.
Hoffman-----	-	-	-	-	XIII, p. 481.
Holmes-----	-	-	-	-	See Miller.

*Ownership shown in this table are those shown on assessment rolls.

TABLE OF QUARTZ MINES AND PROSPECTS TUOLUMNE COUNTY—Continued.

Name of mine	Location			Owner's name and address*	Eleva- tion, feet	Area, acres	Bibliography
	Sec.	Twp.	Range				
Homestake-----	12	1 S.	14 E.	Homestake Mining Co. of Tuolumne, c/o Wm. Burlett, 239 Granite St., Pacific Grove	3300	20	See Rising Sun.
Homestake-----	28	2 N.	16 E.	Wm. Mansfield, Tuolumne, Calif.			XIII, p. 482.
Homestead-----	31	2 N.	14 E.	Hope Mines Dev. Co., Boston Bldg., Salt Lake City, Utah.	2175	30	XIII, p. 482; XIV, p. 152. XX, p. 21.
Hope-----	18	2 N.	15 E.	Green Cons. G. Mining Co., c/o Thos. Magee & Sons, 135 Stutter St., San Francisco—			
Hudson & Calhoun-----	35	1 S.	15 E.	Chas. F. Harper, Trustee, Box 277, Bakersfield.	2250	58	
Hughes Cons. & Dyneta-----	21	1 S.	15 E.	J. G. Huston, 2705 O St., Sacramento		147	
Hull-----	1	1 S.	16 E.	Chas. L. Winchell, c/o G. C. Henley, P. O. Box 478, Sonora-----	VIII, pp. 670-672; X, p. 755; XI, pp. 501-502; XII, p. 299; XIII, p. 474; XIV, p. 138.	153	XIV, p. 152. See Confidence.
Hunter-----	22	1 N.	16 E.	Annie K. Sharwood, J. H. West, Mrs. C. Curnow, Soulsbyville et al.	20		
J. G. Huston-----	13, 24	1 S.	14 E.	John C. Faxon, et al. c/o Mrs. Clotilda Faxon-Bachman, Sonora-----	20		
Hyde-----	19	1 S.	15 E.	George Rose, R. F. D. 1, Sonora-----			XIII, p. 482.
Imperial-----	13, 23	2 N.	15 E.	J. B. Bacon, Windsor, Calif.	110		
Independent-----	24	2 N.	15 E.	John Royal Mining Co., c/o A. H. Blakely, 316 Pasadena Ave., South Pasadena (also assessed to C. E. & Albert Smith, Columbia)-----	1400		
Independent-----	31	2 N.	16 E.	Henry T. Gage, Merchants National Bank Bldg., Los Angeles-----	1400		
Isabella & Gem-----	5	1 N.	14 E.	Mrs. Mary Ferretti c/o Mrs. W. J. Horan, 435 E. Poplar St., Stockton-----	110		XIV, p. 164.
Jackson Flat-----	29	2 N.	14 E.	J. S. Sanginetti, Box 235, Sonora-----	18		XX, p. 183.
James-----	18	2 N.	16 E.	C. O'Shea and J. W. Schiffman, Jamestown, Mocca sin District-----	26		XIII, p. 482.
Joe Hooker, Wildcat-----	1	2 N.	14 E.	John Royal-----			X, p. 50; XIII, p. 482; XIV, pp. 152-153; Bull. 18, pp. 131-132.
John Royal-----							
Jones-Tarantula-----	2	1 S.	14 E.				
Josephine-----							
Julia-----	5	1 N.	15 E.				
Jumbo-----	27, 35	1 N.	14 E.				
Jumper & Golden Rule-----							

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Junction-----	19	2 N.	14 E.	F. McArdle, Sonora.	XIII, p. 482.
Justice-----	7	1 S.	17 E.	Mrs. Agnes Parr, London, England	XIII, p. 482.
Kaiser-----	18	1 S.	15 E.	Peter M. Shaw, c/o Harriman Mining & Milling Co., Tribune Tower, Oakland	VIII, pp. 669-670; XII, p. 308; XIII, p. 482; XIV, p. 153.
Kanaka-----	25	3 S.	15 E.	Louis Green, 1001 Alaska Comm. Bldg., 310 Sansome St., San Francisco	27
Keltz, No. Ext., Kelvin-----				2800	70
Kephart-----				X, pp. 755-757; XI, pp. 504-505; XII, p. 153.	20
Kincaid Flat Mining Co.-----				XII, p. 510.	12
King Solomon-----				XIII, p. 483.	
Knox & Boyle-----				XIII, p. 483.	
Kriss-Kross-----				See Santa Isabel.	
Lady Washington-----				XII, p. 303; XIII, p. 482; XIV, p. 153.	
Lamphere-----	21	1 S.	16 E.	X, p. 752; XI, p. 498; XII, p. 303; XIII, p. 482.	
La Guria-----	3, 10	2 N.	16 E.	A DeFerrari, Groveland	160
La Preciosa-----	33	1 N.	16 E.	No. Confidence Mining & Dev. Co., c/o Mrs. M. Kleinecke, Secretary, 6 Nogales St., Berkeley	160
Last Chance-----				141	20
Last Chance, Fair View-----				XII, p. 483; XI, pp. 503-504; XIV, p. 153.	
In Son ora-----				20	
Last Chance, Free Lode, Charley Haley & Wilbur-----	8, 9	1 S.	15 E.	Mrs. R. E. McGrane & Mrs. H. Eddy, c/o Mrs. Helen Eddy, Sonora.	See Colby.
Laura & North Star-----	5	1 N.	16 E.	XI, p. 505; XII, p. 483.	XVIII, p. 99.
Lead & Tam O'Shanter, Toledo Cons., Buena Vista-----	32	2 N.	16 E.	XI, pp. 498-499; XII, p. 303; XIII, pp. 483-484; XIV, pp. 153-154.	
Iena-----	19	2 N.	14 E.	X, p. 56; XIII, p. 484; XIV, p. 154.	
Lewis-----	22	3 S.	15 E.	See Seminole	
Little Florence-----	14, 16	1 N.	14 E.	XIV, p. 154.	
Little Gem-----	24	1 S.	15 E.	See Seminole	
Little Jessie-----				21	
Little Wonder-----				10	
Live Oak-----	2	1 S.	14 E.	X, p. 742; XIII, p. 484.	
Lone Star-----				See Confidence	
				XIII, p. 484.	
				See Black Oak.	
				20	

*Ownerships shown in this table are those shown on assessment rolls.

TABLE OF QUARTZ MINES AND PROSPECTS, TUOLUMNE COUNTY—Continued.

Name of mine	Location			Owner's name and address*	Eleva- tion, feet	Area, acres	Bibliography
	Sec.	Twp.	Range				
Longfellow, Toughnut-----	30	1 S.	16 E.	A. G. Metz, 535 Van Nuys Bldg., Los Angeles-----	2900	16	VIII, pp. 672-673; XI, p. 494; XII, p. 303; XIII, p. 484; XIV, p. 154; Bull. 18, p. 139. See Pena Blanco
Lookout-----	31	1 N.	16 E.	J. S. Kuns, Los Angeles-----	1000	60	XIV, p. 154.
Los Angeles-----	31	2 N.	16 E.	E. R. Pearce, 2333 Larkin St., San Francisco-----	3200	50	XII, p. 484; XIV, pp. 154-155.
Louisiana-----	29	1 N.	16 E.	C. F. Stucki, Groveland-----	1200	40	XIV, p. 155. See Pena Blanco.
Lucky Boy-----				D. Lumsen & Sons, Big Oak-----			XI, p. 494; XII, p. 303; XIII, p. 484; XIV, p. 155.
Lucky Star-----				A. G. Metz, 535 Van Nuys Bldg., Los Angeles-----	3100	20	XII, p. 484; XIV, p. 155; Bull. 18, p. 140.
Lumsen-----		1 S.	16 E.	J. W. Schiffman, P. E. Mertz, L. S. Grant, et al., Jamestown-----			XVII, p. 485. See Old Tuolumne
Mack-----	9	2 N.	16 E.	Jos. & Geraldine Maddox, Confidence-----	140		21
Madelon-----	24	2 N.	14 E.	Louis, Mark & Miss Marian F. Page, Sonora-----			XIII, pp. 484-485.
Maddox-----							
Magnolia-----	24	2 N.	14 E.	Philomena Mangante, Adm'r Estate Jos. Man-			
Magruder-----				grante, Sonora-----	1350	22	XIV, p. 155; Pre. Rep. 8, p. 40.
Mammoth-----	10	1 N.	14 E.	Mary F. L. Scott & Amelia Coffey, c/o Mary F. L. Scott, Sonora-----			XI, p. 506. See Philadelphia & Rhode Island.
Manganite-----	1, 2	1 N.	14 E.				
Manzanita-----							
Martin-----							
Mary-----	32	2 N.	14 E.	{Geo. E. Bates, 1509 de Young Bldg., 690 Market St., San Francisco-----			
Maryatt-----	{32	2 N.	13 E.		11		
No. Ext. Maryatt-----	31	2 N.	14 E.			9	
Mary Ellen-----	32	1 N.	16 E.	A. B. Crichtshank, Chancery Lane, W. C. 2, London, England-----			
Mascot-----	10	1 N.	14 E.	D. L. Mann, Jamestown-----	1350	26	XI, p. 494; XIII, p. 486.
Mayflower-----	4	1 N.	16 E.	I. J. Miller, Lod & Huber, Shawmut-----	2100	10	XI, p. 494; XIII, p. 485; XIV, p. 155.
Mazepa-----	35	1 N.	14 E.	Mazepa Mine, Inc., c/o L. G. Baum, Jamestown-----	1250	101	XII, p. 485; XIII, pp. 155-156.
McAlpine-----	18	2 S.	16 E.	McAlpine Mines Co., c/o Miss Fannie W. McLean, 1829 Bancroft Way, Berkeley-----	2200	43	XI, pp. 509-510; XIII, p. 485; XIV, p. 156.
							X, p. 43; XIII, p. 485; XIV, p. 156.

McArdle	24	2 N.	13 E.	T. H. McArdle, et al., c/o F. McArdle, Sonora.	18
McCann	8, 9	1 S.	15 E.	Andrew McCormick, 6 East Main St., Stockton	2000
McCormick					59
McCure					
McTarnahan					
Meade					
Merritt & Gold Nugget					
Mexican					
Miller & Holmes					
Mina Verde	21	1 S.	16 E.	J. B. DeMartini, Groveland	2900
Miracle					40
Miranda					
Mississippi					
Moccasin & Golden Key	30 6, 7	2 S. 2 S.	14 E. 16 E.	Roddon Brothers, 1st National Bank, Oakdale. Moccasin Cons. Gold Mining Co., 626 Hearst Bldg., San Francisco	1200
Mitchell					160
Mohawk					
Mohican	31, 32	1 N.	16 E.	Mohican Milling & Mining Co., 401 Alaska Commercial Bldg., San Francisco; R. E. McHale, agent	900
Mohrman	30	1 S.	16 E.	G. B. Musante, Big Oak Flat	98
Monitor					15
Montreal Cons.	30	2 S.	14 E.	J. A. Gillis & F. L. Mitchell, R. F. D. I., Sonora	-----
Monte Cristo					
Moody	30	1 S.	16 E.	W. A. Nevills Estate	2780
Mooney	30	1 S.	16 E.	G. B. Musante, Big Oak Flat	2850
Mormon				C. Layman & J. A. King, Confidence	3010
Morning Glory				See Kelly	-----
Mother Lode				Annie K. Sharwood, John N. & E. W. S. Woods, c/o Willott & Sons, Stockton	20
Mountain Bell & Parallel	30	2 N.	16 E.	Ernest W. Harker, c/o Attorney H. M. Anthony, Humboldt Bank Bldg., San Francisco	22
Mt. Jefferson	21	1 S.	16 E.	-----	2900
Mt. Stanislaus					30
Mount Vernon & Green Cons	{ 1 36 31, 32	2 N. 3 N. 2 N.	16 E. 16 E. 14 E.	Green Cons. Gold Mining Co., c/o Thos. Mage & Sons, 135 Sutter St., San Francisco. Green Cons. Gold Mining Co., c/o Thos. Mage & Sons, 135 Sutter St., San Francisco	-----
Mountain View Cons.					53
Mountain View	3	15 N.	14 E.	Mrs. Maria Consolo, Heirs of W. G. Rowe, Chinese Camp	35
Mt. Zion	21	1 S.	16 E.	F. L. Cassaretto, H. Cramer Estate, Groveland, et al.	21

*Ownerships shown in this table are those shown on assessment rolls.

TABLE OF QUARTZ MINES AND PROSPECTS, TUOLUMNE COUNTY—Continued.

Name of mine	Location			Owner's name and address*	Eleva- tion, feet	Area, acres	Bibliography
	Sec.	Twp.	Range				
National Group-----	23, 26	1 S.	15 E.	Sierra Mining Co., c/o A. T. Waltz, 917 C. C. Chapman Bldg., Los Angeles-----	2500		XVII, p. 485; XVIII, p. 100; Pre. Rep. 8, p. 41. See Sugarman
Neale-----	19	2 N.	14 E.	H. & H. F. Neubaumer, c/o H. G. Neubaumer, Oakdale-----	140		XIII, p. 487.
Never-Sweat-----				James Ballentine, Big Oak Flat-----			XII, p. 304; XIII, p. 366; XIV, p. 157.
New Albany-----				Part of United Mines Group-----			XI, p. 765; X, p. 752; XI, p. 497; XII, p. 304; XIII, p. 487.
New Era-----	29	2 N.	14 E.	Part of Jumper-----			XI, p. 509; XIII, p. 487.
New Grand Turk-----	15, 16	1 N.	16 E.	A. W. Stinchfield, Tuttleton-----	20		
New Year-----				Cora G. Muller & Mary M. Henningsen, c/o C. C. Muller, Apt. 6, 1480 Larkin St., San Francisco-----	2250	20	XII, p. 304.
New York-----				Mrs. Helen Wainright, Sonora-----			X, pp. 737-738.
Nonpareil-----	19	1 S.	16 E.	See Phil O'Neil Mine-----			XIII, p. 487.
Noonday-----				Walter H. Linforth, 712-714 Chronicle Bldg., San Francisco-----	2800	20	XIV, p. 157.
North Confidence-----	4, 9	2 N.	16 E.	No. Confidence Mining & Dev. Co., c/o Mary Kleincke, Secretary, 6 Nogales St., Berkeley-----			XIII, p. 487.
North Extension-----							See Lamphere.
No. Ext. of Green et al.-----	36	3 N.	16 E.	Phil. M. Ryan, Sonora-----	31		XIII, p. 487.
North Fork-----							See Donella.
North Star-----							See Laura & North Star.
Black Warrior-----	21, 28	1 S.	15 E.	John M. Babra, M. S. de Albergaria, 615 French Bank Bldg., San Francisco-----			
Yellow Jacket-----				H. A. & M. E. Horlein, 15 Stockton St., San Francisco-----	1200	56	XIII, p. 487.
Norwegian-----	18, 19	2 N.	14 E.	Clarissa A. Trittenbach, R. F. D. 1, Sonora-----			
{ Nut Pine-----	30	2 N.	14 E.				XIV, p. 157.
Nyman Cons.-----	32	2 N.	14 E.				XII, p. 305; XIV, p. 157.
O'Donnell-----	15	1 N.	14 E.	W. C. & C. E. Rudy, c/o W. Rudy, Route 1, Box 210, Escalon-----	1150	39	XIV, p. 157.
O'Hara-----	25	2 N.	14 E.	J. F. & James O'Hara, Sonora-----	1900	10	XIII, p. 487.
Ohio-----	32	2 N.	14 E.	Tuolumne Co. Bank, c/o C. H. Segerstrom, Sonora O. K. & No. Ext.-----	1300	40	XIV, p. 158.

Old Dominion -----	2	2 N.	14 E.	Richard G. Bell, Columbia-----	2400	120	XIV, p. 158.
Old Toulumne -----	{ 1	2 N.	14 E.	Old Toulumne Mining & Dev. Co., c/o W. F. Geary, P. O. Box 497, Sacramento-----	1860	89	XII, p. 305; XIII, p. 487; XIV, p. 158.
Old Toulumne -----	{ 6	2 N.	15 E.	-----	-----	20	-----
Olsen -----	{ 36	3 N.	14 E.	H. J. Langdon, c/o D. C. Demarest, Angels Camp-----	-----	-----	-----
Omega Table Mountain Gravel Mine -----	{ 32	2 S.	14 E.	Peter A. Herivel, 7/8; Chas. E. Beyer, 1/8, c/o P. A. Herivel, 590 I. W. Hellman Bldg., Los Angeles-----	1200	89	XIV, p. 158; XIX, pp. 19, 145; XX, p. 21.
O. P. -----	6	1 N.	14 E.	Edna Callender, Mrs. Ira Condit, 908 Indian Rock Ave., Berkeley; Mary Marsicano, 781 Green St., San Francisco, et al.-----	21	XII, p. 305; XIII, p. 487; XIV, p. 158.	
Ophir -----	7	2 N.	16 E.	James Brothers, Groveland-----	-----	-----	-----
Ophir -----	-----	-----	-----	Chas. Bryan, Big Oak Flat-----	-----	-----	-----
Orcutt -----	-----	-----	-----	See Mammoth.	-----	-----	-----
Orin -----	-----	-----	-----	See Old Tuolumne.	-----	-----	-----
Oversight -----	15	1 S.	15 E.	Jas. Blankenship, Big Oak Flat-----	12	-----	-----
Pacific, Nuttall, Pine Ridge & Irish -----	{ 15, 16	1 N.	14 E.	Estate of B. M. Newcomb, c/o R. P. Newcomb, 1409 Grand Ave., Piedmont-----	-----	XIII, p. 482.	-----
Page -----	{ 20	1 N.	14 E.	-----	-----	XII, p. 305; XIII, pp. 487-488.	-----
Palo Alto -----	{ 25	2 N.	14 E.	-----	-----	XIII, p. 488.	-----
Parole -----	18	2 N.	16 E.	G. T. Barron, Tilden, et al., Soulsbyville-----	25	VIII, pp. 656-657; XII, p. 303; XIII, p. 488; XIV, p. 158; XVII, p. 485;	-----
Patterson, Lennon -----	29	2 N.	14 E.	Elfreda Davis Wright, 1/3, c/o B. B. Brace, Oakland Bank Bldg., Oakland; C. A. Fitzgerald, Quartz, 2/3-----	1500	XVII, pp. 100-101; XIX, p. 74; Pre-Rep. 8, p. 41.	-----
Paymaster -----	30	2 S.	14 E.	J. G. Hopper, c/o Wm. H. Metson, San Francisco-----	-----	XVIII, p. 101.	-----
Peck -----	-----	-----	-----	See Stonewall.	-----	-----	-----
Pedro -----	-----	1 N.	14 E.	Ross & Chamberlain, c/o J. I. Ross, Redwood City-----	55	XII, p. 488; XIV, p. 159.	-----
Pena Blanca -----	5	1 N.	16 E.	-----	2800	XI, p. 500; XIII, p. 488.	-----
Pennsylvania -----	-----	-----	-----	See Soulsby.	-----	-----	-----
Pet Cossey -----	20	1 S.	15 E.	Estate of Anna A. Preston, c/o G. M. Booker Fletcher-----	14	-----	-----
Philadelphia, Boston & Rhode Island -----	16, 21	1 N.	16 E.	Wm. H. Mathewson, Tuolumne-----	-----	XIII, p. 488.	-----
Phil O'Neill -----	19	1 S.	16 E.	Ernest W. Harker c/o H. M. Anthony, Humboldt Bank Bldg.-----	-----	See Nonpareil.	-----
Phoenix Lake -----	36	2 N.	16 E.	Phoenix Lake G. Mining Co., c/o Jno. Frey, 7th & Berry St., San Francisco-----	-----	-----	-----

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TABLE OF QUARTZ MINES AND PROSPECTS, TUOLUMNE COUNTY—Continued.

Name of mine	Location			Owner's name and address*	Eleva- tion, feet	Area, acres	Bibliography
	Sec.	Twp.	Range				
Pine Log	36	3 N.	14 E.	United Mines Co., c/o F. L. Mitchell, Columbia	-----	-----	XVIII, p. 99.
Pine Nut	31	1 N.	16 E.	J. W. Purdy Estate, Mrs. Emma Edmiston, 416 Broderick St., San Francisco, trustee	21	-----	XII, p. 305; XIII, p. 489. See Confidence.
Pine Tree	-----	-----	-----	-----	-----	-----	See Soulsby.
Pi-Ute	-----	-----	-----	-----	-----	-----	-----
Plowboy	-----	-----	-----	-----	-----	-----	-----
Platt & Gilson	24	1 N.	15 E.	Yankee Hill G. Mining Co., c/o A. J. Padghan, President, Santa Rosa	200	200	Field Report. XI, p. 498.
Poison Oak	-----	-----	-----	-----	-----	-----	-----
Poor Man's Friend	5	1 N.	16 E.	Porto Fino Mine, c/o Mrs. E. L. Hill, Box 553, Tuolumne	-----	-----	XIII, p. 489.
Porto Fino	-----	-----	-----	-----	-----	-----	-----
Pride of Tuolumne	6	1 N.	14 E.	D. Martin, Jamestown, et al.	-----	-----	-----
Prospect	9	1 N.	16 E.	New Providence Old Mining Co., 2041 Emerson St., Berkeley	2600	90	XIII, pp. 478-479; XIV, p. 159; Bull. 18, p. 138.
Providence	-----	-----	-----	-----	-----	-----	-----
Prudhomme, Cordova	33	2 N.	16 E.	Claire McNee, c/o M. W. McIntosh, 114 Sansome St., San Francisco	3550	-----	XIII, p. 489. XII, p. 306; XIII, p. 489; XIV, p. 159.
Puerto-Fino	12	1 N.	14 E.	William Sharwood, Soulsbyville	-----	-----	-----
Punter	19, 20	1 S.	16 E.	Wm. Punter, Sonora	20	-----	-----
Raggio	5	1 N.	14 E.	Mrs. Norman Smith, 4227 14th Ave., Route 4, Box 197, Sacramento, et al.	-----	5	XIII, p. 489.
Rappahannock	5	1 N.	14 E.	J. C. Webster, Sonora & A. C. Mohr, Associated, Contra Costa County, California	1625	33	XII, p. 306; XIII, p. 489; XIV, p. 159.
Rattlesnake	5	1 N.	16 E.	Alice G. Newton, Box 52, Fairfax	13	-----	-----
Rawhide	4, 5 8, 9	1 N.	14 E. 14 E.	Central Land Co., c/o Union Trust Co., San Francisco	1670	291	X, p. 54; XI, pp. 507-508; XII, p. 306; XIII, p. 489; XIV, pp. 159-160; XVII, p. 101; Pre. Rep. 8, p. 41; Bull. 18, pp. 129-130.
Rawhide No. 2	-----	-----	-----	A. Hayward Estate, San Francisco	-----	-----	XII, p. 306; XIII, p. 489; XIV, p. 160. See Hoffman.
Ready	8	2 N.	15 E.	Estate of Eugene Ellis, c/o Mrs. J. W. Ellis, Columbia	-----	-----	See Omega.
Red Cross	-----	-----	-----	-----	-----	-----	-----
Redemption & Ice House	-----	-----	-----	-----	-----	-----	-----

Red Jacket-----	29	1 S.	16 E.	V. J. Repetto, Big Oak Flat-----	2900	20	XIII, p. 489; XIV, p. 160.
Relief & Surplus-----	29, 30	2 N.	14 E.	Mayne Irene Jacobs & Chas. F. Helmam, c/o Mrs. Jacob Myer, 373 10th Ave, San Francisco-----	900	15	X, p. 47; XIII, p. 489; XIV, p. 160; Bull. 18, pp. 133-134.
Republican-----	{ 32 12, 13 18	{ 2 N. 1 S. 1 S.	{ 14 E. 14 E. 15 E.	{ Republican Mining & Development Co., Mills Bldg., San Francisco-----	2800	87	X, p. 47; XIII, p. 489; XIV, p. 160.
Reward, Madison, April-----	13, 24	2 N.	16 E.	John Roeca, Jamestown-----	36		
Rhode Island-----	21	1 S.	16 E.	Santa Aya Mining Co., c/o Frank J. Callahan, 162 Federal St., Boston, Mass.-----			
Ribbon Rock-----							XIII, p. 489.
Rice-----							See Old Tuolumne.
Richards-----	9	1 N.	16 E.	Thos. and Miss M. K. Richards, Sonora, et al.-----			XVII, p. 99.
Rifle-----	5	2 N.	15 E.	J. K. Hunter Estate, c/o Street & Street, 708-709 Hobart Bldg., San Francisco-----			XIII, p. 489.
Rikert Homestake-----	28	2 N.	16 E.	William Mansfield, Tuolumne-----	3300	20	XIII, p. 489.
Rising Sun-----							XI, pp. 503-504; XIII, p. 482; XIV, p. 161.
Ritchie-----	30	2 N.	14 E.	Riverside Quartz Mining Co., c/o Mrs. E. H. Williams, 948 Peralta Ave., San Leandro-----	1500		XIII, pp. 489-490.
Riverside-----	26	3 N.	15 E.	D. E. Stratton, Sonora-----	1960	18	XIII, p. 490; XIV, p. 161.
Riverside et al.-----	21	1 S.	15 E.	B. L. A. Harker, c/o H. M. Anthony, Humboldt Bank Bldg., San Francisco-----	129		
Robinson-----	19	1 S.	16 E.	Charles Martin, 425 de Young Bldg., San Francisco-----	147		
Roosevelt et al.-----	7, 8	3 N.	15 E.				XIII, p. 490.
Ross-----							XIII, p. 490.
Royal Granite-----							XVII, p. 101.
Russell Ranch-----							
Ryan Group-----	36	3 N.	16 E.	James Ryan, Sonora-----	70		
Sailor Boy-----							
San Guiseppe-----				Fred Sutton, Sonora-----			
Santa Maria-----							
Santa Ysabel Cons.-----	27	1 N.	14 E.	Nyman Cons. Mines Co., c/o F. G. Mudgett, Secretary, 502 Humboldt Bank Bldg., San Francisco-----	1550	100	X, p. 51; XII, p. 304; XIII, p. 490; XIV, p. 161; XVIII, p. 101; Bull. 18, p. 131.
Santissima-----	30	2 N.	14 E.	W. R. Gillis, ½; Jeanna Bluett, ½, R. F. D. 1, Sonora-----		9	
Sarah Francis-----							See Pena Blanco.
Seeger-----							VIII, p. 664.
Sell-----	30	2 N.	15 E.	Estate of J. K. Sell & W. M. Sell, Ahwannee-----	2400	20	XIII, p. 489; XIV, pp. 161-162.
Seminole-----	9	1 N.	15 E.	O. F. Heizer, C. F. Holman, Sonora-----	2690	20	XIII, p. 491; XIV, p. 162.

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TABLE OF QUARTZ MINES AND PROSPECTS, TUOLUMNE COUNTY—Continued.

Name of mine	Location			Owner's name and address*	Elev- ation, feet	Area, acres	Bibliography
	Sec.	Twp.	Range				
Severt Cons.	19	2 N.	15 E.	J. Mitchell, Box M., Sonora.			
Shanghai	6, 7	2 N.	15 E.	R. H., L. V. & M. A. Morgan, c/o Lon P. Fraser, 3042 College Ave., Berkeley.			XIII, p. 491.
Shawmut et al.	{ 1, 2 11, 12 13	{ 1 S. 1 S. 1 S.	{ 14 E. 14 E. 14 E.	Eagle Shawmut Mining Co.			VIII, pp. 674-675. See Street Mine.
Shaw Flat							VIII, p. 675.
Shaw & Scheller							XIII, p. 306; XIII, p. 491; XIV, p. 162.
Sheepherder							XIII, p. 491.
Silkens							XIII, p. 491.
Sierra G. Mining Co.	In Groveland			C. P. Hall & C. A. Hall, Big Oak Flat. c/o E. N. Berkeleer, Arlington Heights, Illinois			XIII, p. 491.
Silver Star							XIII, p. 491.
Silver Star							See Page.
Simonich							
Slap Jack	27	1 S.	16 E.	C. E. Smith, Groveland.	2900	20	
Smooth Bore	{ 5, 4 8	{ 2 N. 9 3 N.	{ 15 E. 15 E. 15 E.	{ E. W. Murphy, 112 Union St., Oakland; Kress, 1116 Union St., Oakland Col. Dorsey Estate, San Francisco	2600		XI, p. 505; XIII, p. 491; XIV, p. 162. See Harvard.
Shell							
Sobrante							
Somerset	15, 22	1 N.	16 E.	M. Sharwood, c/o Annie K. Sharwood, 2808 Woolsey St., Berkeley.	14		XIV, p. 162.
Sonnet	26	3 N.	15 E.	R. C. Davis, Columbia, et al.	2800	40	X, pp. 748-750; XIII, p. 306.
Sonora Cons.							See Rising Sun.
Sonora Extension							
Sonora Wonder							
Sonorita							
Sophia	Gibson Johnson & Bradbury, Churchill, Platt	31	2 N.	16 E.			
Spring Gulch		21	1 N.	16 E.	2900	160	VIII, p. 666; X, pp. 742-744; XII, p. 305; XIII, p. 475; XIV, p. 162.
Stanley		17	1 S.	15 E.	2700	39	XIII, p. 492; XVII, p. 101; XX, p. 21.
Stanley & Bean		23, 24	3 N.	15 E.	900		XI, p. 510; XIII, p. 492.
Star							See Godfrey.
							XIII, p. 492; XIV, p. 163.
					2300	20	

Starr King-----	15	1 N.	16 E.	Donald C. Kennedy, 545-553 Golden Gate Ave., San Francisco -----	3000	40	XIV, p. 163. See Chileno.
Stenchifield-----							XIII, p. 492. XVIII, p. 99.
Stewart-----							
Stockton-----							
Stockton-----	7, 8	3 N.	16 E.	Stockton G. Mining Co., c/o W. C. Ramsey, Record Office, Stockton -----		542	XIII, p. 492.
Stockton-----	17	3 N.	16 E.				XIV, p. 163.
Stockton-----	12, 13	3 N.	15 E.				XIII, p. 492.
Stockton-----	25	2 N.	14 E.	William Pedro, Sonora -----	1900	20	XIV, p. 163.
Stockton-----	29	2 N.	14 E.	A. A. Smith, 1128 Broadway, Oakland -----	1500	20	XIV, p. 163.
Stockton-----	25, 26	2 N.	14 E.	Helen Wainwright, Frank Tomison, Sonora, et al. -----	2100	40	XIV, p. 163.
Stockton-----	30	2 N.	15 E.	F. M. Butler, C. F. Smith, C. R. Watson, Sonora -----	2300	25	XIV, p. 163.
Stockton-----	19	2 N.	15 E.				XIII, p. 492.
Stockton-----							See Richards.
Sullivan-----							
Sullivan-----	9	1 N.	16 E.	Mary W. & Mae D. Crawford, c/o Anglo & London Paris National Bank, San Francisco; T. Richards & Miss M. K. Richards, Sonora -----	24		
Sweeney-----							XIII, p. 492.
Swerer-----							XIII, p. 493.
Tam O'Shanter-----							
Tanzy-----	15	1 N.	14 E.		1550		
Tanzy-----	32	2 N.	14 E.				
Tanzy-----	31, 32	2 N.	14 E.	Mrs. M. R. Clement, 422 Pacific Ave., Piedmont -----			
Tarantula-----	36	2 N.	14 E.	J. F. O'Hara, Sonora -----	2100	10	XIV, p. 493; XIV, p. 164.
Tarantula-----	5	1 N.	14 E.	Eric J. Segerstrom, Sonora -----	1600	18	XIV, p. 493; XIV, p. 164.
Tarantula-Gold Ridge-Reitz Group-----	5	2 N.	14 E.				
Temesca-----	34	3 N.	16 E.	See Jones.	2700		XVII, pp. 485-486.
Thompson Hill, Gillis, Ala.	29, 30	2 N.	14 E.				XX, p. 21.
Tin Can, Santa Claus-----	20	2 N.	14 E.	W. P. Gillis, Tuttletown -----		59	
Todd & Hunter-----				Fred Bryant, R. F. D. I., Sonora -----		20	
Toledo-----							See Hunter.
Trio-----	21	2 N.	14 E.	Mrs. M. R. Clement, 422 Pacific Ave., Piedmont -----	1400		XIII, p. 493.
True Business-----	12	3 N.	14 E.	Estate of J. B. Curtin, Estate of T. B. Dorsey, Estate of Caleb Dorsey, c/o Mrs. Lucy Curtin, Sonora -----			See Harvard.
Triumph-----	11, 2	3 N.	15 E.				
Triumph-----	7	3 N.	15 E.				
Triumph-----	9, 10	1 N.	16 E.	Al. C. Maier & Bessie L. Carter, 1802 Blake St., Berkeley -----			
Turner-----	26	2 N.	13 E.	Carrie M. & Minnie Turner c/o Dr. W. W. Douglas, 323-A, S. Main St., Hillsboro, Ill. -----			
Two Brothers-----	19, 20	1 S.	16 E.	Two Brothers' Mining Co., c/o J. J. LeTourneau, 2613 Hillegas Ave., Berkeley -----			
Uncle Sam-----	20	1 N.	16 E.	Mrs. Mary Lord, 4532 W. 18th St., Lodi -----			

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TABLE OF QUARTZ MINES AND PROSPECTS, TUOLUMNE COUNTY—Continued.

Name of mine	Location			Owner's name and address*	Eleva- tion, feet	Area, acres	Bibliography
	See.	Twp.	Range				
United-----	36	3 N.	14 E.	United Mines Co. of California, c/o F. L. Mitchell, Columbia-----	XIV, pp. 164-165; Pre. Rep. S, p. 41.		
United Mines Group-----	9, 4	1 N.	16 E.	Grizzly Mining Co., c/o Horace M. Street, 709 Hobart Bldg., San Francisco-----	2000	169	
Union & Rough & Ready-----	27, 28	1 S.	15 E.	J. W. Stevens, 203 Webster St., Oakland-----	XIII, p. 493. XIII, p. 493.		
Uroquhardt-----	26	3 N.	16 E.	Lake Superior & Nevada Dev. Co., 218 W. Superior St., Duluth, Minnesota-----	XIV, p. 164.		
Utopia-----	11, 14	4 N.	15 E.	Valleito Mining Co., c/o L. M. Hoelter, 105 Montgomery St., San Francisco-----	2600	200	
U.S. Grant-----	29	2 N.	14 E.	Walter Krause, Mrs. Geo. Crozier, Mrs. Jessie N. Lawson, 124 Roosevelt Ave., Redwood City-----	XIII, p. 493. XVII, p. 486; XVIII, p. 101.		
Vallecito-----	17	1 S.	15 E.	Solar, June and Mangante----- Wm. Musso & G. B. Pietronave c/o Golden Poppy Mining Co., Friedburger-Blodgett Bldg., Lodi-----	320		
Valparaiso-----	3	2 N.	14 E.	S. Whetmore, J. V. Bannister, Columbia, et al.-----	18		
Verdun-----	15	2 N.	14 E.	W. W. Fraser, Box 1104, Richmond-----	XIV, pp. 165-166. XIII, p. 493.		
Victoria-----	15	2 N.	14 E.	R. P. Newcomb, 1409 Grant Ave., Piedmont-----			
Vigilance-----	15	2 N.	14 E.	A. Matilda Hanke et al., 921 Market St., Oakland-----			
Vine Spring-----	15	2 N.	14 E.	Duncan McLaren, c/o Rowan Hardin, Sonora-----			
Violet-----	15	2 N.	14 E.	18			
Virginia-----	15	2 N.	14 E.	11			
Volunteer-----	15	2 N.	14 E.	XIII, p. 493.			
Vulture-----	15	2 N.	14 E.				
Watertown-----	15	2 N.	14 E.				
Watson-----	30, 31	2 N.	16 E.	Watson-----			
Wheal & Perrin-----	6	2 N.	15 E.	Wheal & Perrin-----			
Whiskey Hill-----	6	2 N.	15 E.	George A. & Thomas Richards, Sonora; Salve Olsen, Sonora; Mrs. E. C. Wetmore, Sonora; J. W. Richards, 602 14th St., Modesto, et al.-----	2850	9	
White Oak-----	6	2 N.	15 E.	XIII, p. 493; XIV, p. 166. XII, p. 307; XIII, p. 493. See Harvard Mines. See Black Oak.			

Whitto-	35, 36	2 N.	15 E.	M. McCormick Co., c/o Andrew McCormick, 1432 No. El Dorado St., Stockton--	2800	25
Wickham-	1	1 N.	15 E.			13
Wild Cat, Aget,	32	2 N.	14 E.	Margaret J. Hampton, Sonora --		
Iron-----						
Wild Missourian						
Willietta-----						
Wilson & Means, Rice, Stoker, Gillis & Carrington-----	18, 19	1 S.	15 E.	Estate of David Graham, c/o Mrs. Thos. J. Russell, Chinese Camp-----	850	20
Winchester-----	30	2 N.	14 E.	James A. Gillis, R. F. D. 1, Sonora-----		37
Winnie-----						
Wise-----	29, 31	2 N.	14 E.	Stephen Davey & A. A. Swerer, Tuttletown-----	1440	18
Wooters-----	32	2 N.	14 E.	R. B. Lane, c/o H. J. McMahon heirs, 825 9th St., Marysville-----		
Worcester-----	8, 9	1 N.	16 E.			
Yancy-----	16, 17	1 N.	16 E.	Chas. E. Meade, Tuolumne-----	2700	21
Young American-----						

*Ownerships shown in this table are those shown on assessment rolls.

GOLD (PLACER MINES).

While the placer mines of the county were among the richest in the state, there is little to be added at this time to the past reports on this branch of the industry. Most of the later placer gold production has been from small operations carried on by one or a few men each. The only company that has worked steadily has been the *Springfield Tunnel and Development Company*, whose property and operations have been heretofore described. They have not reported any developments of importance for several years.

The total production of placer gold in the county in 1926 was \$9,681 from 17 producers, and for the past twenty years the yearly placer gold output has been small. This is in marked contrast to the early mining history of the region. The shallow placers of the Columbia and Springfield districts are commonly claimed to have produced \$55,000,000 as indicated by express company's records, and the other districts of the county are credited with an output of \$101,000,000. Of these, the most important were: Groveland, Deer Flat and Big Oak Flat, with a total output of \$25,000,000; Sonora, \$11,000,000; Don Pedro Bar, Jacksonville and Stevens Bar, together credited with \$9,000,000; Gold Springs and Nigger Gulch, \$7,500,000 and many others.

The county was famous also for the many large nuggets found. The surface and shallow placers were the richest, and the buried channels in place have produced a comparatively small part of the total. Erosion of the Mother Lode contributed to the richness of the deposits in the western part of the county, as did that of the pocket veins in the vicinity of Sonora and Bald Mountain. The erosion and concentration of vast quantities of bedrock material and segments of ancient channels which were themselves 'spotted' or even low in gold content, accounts for the great quantities of gold found in the shallow placers.

The ancient channel systems crossing the county have been discussed in detail by Lindgren¹ and Haley,² and the mines have been described in many of the bureau's past publications, as will be seen by reference to the bibliography in the accompanying list of placer mines. Three channel systems have been traced across the county. The most productive, since its erosion fed the Columbia basin, was the so-called Columbia Channel, of which one branch traversed the ridge by way of Sugar Pine and Confidence, passing near Soulsbyville and going thence to Columbia with a branch entering from the north near the crossing of Woods Creek. Little, if any, success has attended the efforts to mine the upper reaches of this channel although several attempts have been made in recent years. The district immediately surrounding Confidence is the most easterly on the course of this stream where valuable quartz veins are known, and where enrichment of the stream channels might be expected to begin. The ridge from Confidence to a point south of Soulsbyville is covered by andesite, but the section west of there has been completely eroded and reconcentrated except for a few isolated lava caps. Another channel, mostly removed by erosion, traversed the southern part of the county from the vicinity of Hetch-Hetchy in a westerly direction through Chinese Camp. The system of

¹ Lindgren, W., U. S. Geol. Survey, Prof. Paper 73.

² Haley, Chas. S., Calif. State Min. Bur. Bull. 92, pp. 148-150.

channels under Table Mountain in the western section has been prospected ever since the fifties but the gravel has only occasionally been found payable. It is presumed that this 'spotted' character is due to the fact that the channels are later ones which did not erode through the early volcanic flows into the auriferous bedrock formations and consequently such gold as they contain was picked up where they crossed and eroded earlier channels.

TABLE OF PLACER MINES AND PROSPECTS, TUOLUMNE COUNTY.

Name of mine	Location			Owner's name and address*	Elev- ation, feet	Area, acres	Bibliography
	Sec.	Twp.	Range				
Ah Mow-----							
Barley Ranch, American Camp-----	20	3 N.	15 E.	Archie A. Morrison, La Grange-----	90		
Bedrock Blue Gravel-----	27	2 N.	14 E.	Heirs of Duchow Estate, c/o E. M. Duchow, 2111 I St., Sacramento-----	40		Field Report.
Bell Mine-----	2, 3	2 N.	14 E.	Wm. & Hildegarde Grant, Hobart Bldg., San Francisco-----	741		
Best Twenty-----	34, 35	3 N.	14 E.	Mrs. Cecile Shafter, Jamestown-----	20		
Boston-----	17	1 N.	14 E.	D. T. & E. W. Morris, R. F. D. 1, Sonora, et al.	1575		X, pp. 737-738.
Buckeye-----	33	2 N.	14 E.	Table Mountain Mining Co., c/o Francis Wilson, R. F. D. 1, Sonora-----	160		X, pp. 737-738; XIV, p. 160.
Buckeye Gravel-----	27, 34	2 N.	14 E.	A. W. Stinchfield & F. L. Mitchell, R. F. D. 1,	1800		X, pp. 737-738.
Canondale-----	33, 34	2 N.	14 E.	Sonora-----	1800		XII, p. 300; XIII, p. 475.
Cave Diggings-----	28, 29	1 N.	16 E.	Mrs. Annie K. Sharwood, 2808 Woolsey St., Berkeley-----	155		XIII, p. 475.
Cherokee-----	33	1 N.	16 E.	Cherokee Gravel & Gold Mining Co., Soulsbyville	2900		XIV, p. 166; XX, p. 20.
Colorado, Zemiorow & Yankee Hill-----	21, 30	2 N.	16 E.	-----	300		
Columbia Basin-----	32	2 N.	16 E.	-----	300		
Crawford-----	7	2 N.	15 E.	M. L. Kaplin, 438 So. Olive St., Los Angeles-----	135		
Crystal Spring-----	12	2 N.	14 E.	Columbia Basin Dev. Co., 652 Monadnock Bldg., San Francisco-----	2050		37
Darkie-----	11	2 N.	12 E.	T. C. Crawford, London, England-----	2400		XIV, p. 166.
Dell Bacon, Maud Dell, Good Hope-----	6, 7	2 N.	15 E.	Estate of Mrs. C. McTarnahan, 133 Fulton St., Redwood City-----	420		XIV, p. 167.
Douglasville-----	12	2 N.	15 E.	-----	50		VIII, p. 674; X, pp. 737-738.
Duchow-----	22	2 N.	14 E.	R. L. Price, Sonora-----	50		
Empire-----	1	1 N.	14 E.	-----	80		X, p. 737.
Fuji-----	29, 30	2 N.	16 E.	H. West & A. Scanavino, c/o A. Scanavino, Tuolumne-----	10		
Glen Alpine-----	-----	2 N.	14 E.	I. S. & Anna May, Columbia, W. J. Luke c/o A. C. Nelson, Columbia, Frank T. Byrd & W. A. Divoll, Sonora, et al.-----	10		
Hopewell-----	27	2 N.	14 E.	Estate W. A. Duchow, M. C. Duchow, et al., c/o R. Duchow, Sonora-----	80		

Gold Dredge	35	1 S.	14 E.	C. W. Bates, La Grange	56
Gold Ship, Gold Grain, Corp		1 S.	14 E.	Gold Ship Mining Co., c/o W. J. Graham, Box 247,	
Bolt	{	1, 2, 3	16 E.	St. George, Utah, Columbia Mining Water & Power Co., Larkspur	
Good Return	12	1 S.	16 E.	3 N. 14 E. Robert Juka, Sonora	2800
Hathaway	34	3 N.	14 E.	2 N. 14 E. J. P. Dargitz, Soulsbyville	566
Hidden Treasure	25	14 E.		2 N. 16 E. Christian Hcsig, Jamestown & Herbert Gaytes,	XIV, p. 167.
Hosog, Dick & Kent	31	2 N.		1 N. 14 E. 395 Vernon St., Oakland	140
Humbug	32	1 N.		1 N. 14 E. California Co., 60 State St., Boston Mass.	206
Humphfield & Myers	33	2 N.	14 E.	Mrs. Minnie H. Morris, c/o Saul Morris, 202 E.	160
Humfield	10	1 S.	14 E.	Adams St., Stockton	1700
If I Can					26
Jamestown & Comet	4	1 N.	14 E.	Estate of E. C. Sullivan, c/o John Sullivan, Route	See Stanislaus Gravel Nos. 1, 2 and 3.
Kibble & Rowell	16	2 N.	16 E.	1, Sonora	160
Knickerbocker Flat				Millard L. Rowell, Confidence	60
K. S. S.	20	1 S.	15 E.	Peter M. Shaw, Chinese Camp, ½ L. Marconi,	
Laura	32	2 N.	16 E.	Chinese Camp, ½ Peter M. Shaw, Chinese Camp, ½ L. Marconi,	
Marble	1	2 N.	14 E.	Estate of John Scarnavino, c/o Andrew, Henry &	
Marovich	13	2 N.	14 E.	Claude Scarnavino, Tuolumne	20
Martha Washington	17	1 N.	14 E.	Mrs. Ida D. Pettit, 285 Lincoln Ave., Rockville	
McKinley	4	2 N.	16 E.	Center, Long Island, N. Y.	40
Monarch		1 N.	13 E.	Gertrude C. Marovich, Columbia	18
Monday, Bumble Bee	2			14 E. Saul Morris, 202 E. Adams St., Stockton	XII, p. 303; XIII, p. 485.
Montezuma Tunnel	20	1 N.	14 E.	16 E. Monarch Gravel Mining Co., Jerry Casey, Sec., 510	80
Old Home	7	2 N.	15 E.	Page St., San Francisco	XVII, p. 486; XX, p. 21.
Oliver	27	1 N.	13 E.	Calaveras Copper Co., e/o Jos. Sanguineti,	4500
Philadelphia Diggings				Sonora	320
Punch Bowl	20	1 N.	14 E.	Geo. S. Montgomery, Beulah Heights, Oakland	
Pawhida, Paducah	4, 5	1 N.	14 E.	2 N. 15 E. Juko Baldo, et al.	220
Red Gravel				1 N. 14 E. Charles Wagner, Jamestown	120
Red Hill	29	1 N.	14 E.	Heirs of John Arnold, c/o Mathilde M. Drown,	20
Reservoir	1	2 N.	14 E.	R. L. Box 421, Meridian Road, San Jose & W. J.	320
Roosevelt-Butter Cup Cons.	20	1 S.	15 E.	Black, Jamestown	180
					240
					See Colorado.

*Owningships shown in this table are those shown on assessment rolls.

TABLE OF PLACER MINES AND PROSPECTS, TUOLUMNE COUNTY—Continued.

Name of mine	Location			Owner's name and address*	Elev. tion, feet	Area, acres	Bibliography
	Sec.	Twp.	Range				
Rosedale							
Rough & Ready	{ 30, 31 25, 36 3, 10	1 N. 1 N. 1 S.	14 E. 13 E. 14 E.	{ E. Thos. Richards, Sonora & Dennis E. Guerin Minnie Morris, c/o Saul Morris, 202 E. Adams St., Stockton & Rosa & D. Lertora, Jamestown	----- ----- 150	----- ----- 209	See Buckeye.
Salvador	22	2 N.	14 E.	Stratoga Mining Co., c/o P. M. Watkins, 65 Main St., San Francisco	1890	40	X, p. 737; XII, p. 306; XIII, p. 490; XIV, pp. 167-168.
Saratoga							
Specimen Gilell, Never Give Up	{ 9, 10 15, 16 22, 23	2 N. 2 N. 2 N.	15 E. 14 E. 14 E.	{ Suda M. Mapes, Columbia Springfield Tunnel & Dev. Co., c/o Jas. B. Miller Sonora	----- 2300	40 1198	XIV, p. 168; XVII, pp. 486-487; XVIII, p. 101; XX, pp. 22, 183.
Springfield	{ 14 25 24 28, 29	2 N. 2 N. 2 N. 1 N.	14 E. 14 E. 14 E. 15 E.	{ M. A. Cowan, c/o Mrs. W. H. Rablen, Sonora A. L. Pedro, Columbia Western King Mining Co., c/o Wm. Kieff, 608 Folsom St., San Francisco	----- ----- 10 700	----- 10 700	VIII, p. 575; XIV, p. 168.
Spring Hill & Cowan							
Squabbletown							
Stanislaus No. 1, 2 and 3							
Stockton	{ 7, 8 12, 13 36 28	3 N. 3 N. 3 N. 2 N.	16 E. 15 E. 16 E. 15 E.	{ Stockton Gravel Mining Co., c/o W. G. Ramsey, Record Office, Stockton Phil. M. Ryan, Sonora Mrs. H. Cramer, Sr., 166 Second St., San Jose;	----- ----- 542 50	----- ----- 300 92	VIII, p. 575; XIV, p. 168.
Sugar Pine							
Sullivan							
Table Mountain, Alpha	9	1 N.	14 E.	E. & C. Bortini, Sonora	-----	300	
Ventura Grubstake Co.	{ 19, 20 29	1 N. 1 N.	14 E. 14 E.	{ J. N. Oliver, Jamestown c/o J. J. Habercker, Jamestown	----- 503	92 503	
Weidikind	36	3 N.	14 E.	Eric Segerstrom, Sonora	-----	20	
White Lead	11	2 N.	14 E.	Minian Mining Co., c/o Chas. C. Gross, 458 Mills Bldg., San Francisco	-----	10	
Williamson	14	2 N.	14 E.	Sadie J. Brub, P. O. Box 151, Modesto	20	20	XI, p. 507; XII, p. 295; XIII, p. 472.

*Ownership shown in this table are those shown on assessment rolls.

GRANODIORITE ('GRANITE').

Two small 'granite' quarries have been operated in the county but both are idle now. The stone is a pleasing bluish gray granodiorite of medium texture.

Phoenix Lake Granite Company, care Western Granite Works, Stockton Ave., San Jose, owns 120 acres in Sec. 23, T. 2 N., R. 15 E., about six miles northeast of Sonora. This property was formerly a producer.

Sonora Granite Company was organized to work a granodiorite deposit on the Rablen Ranch in Sec. 14, T. 1 N., R. 15 E., three miles from the nearest shipping point on the Sierra Railway. Some small buildings were put up and an air compressor and small tools installed. A few carloads of the stone were shipped, but there has been no activity since July, 1923.

GRAPHITE.

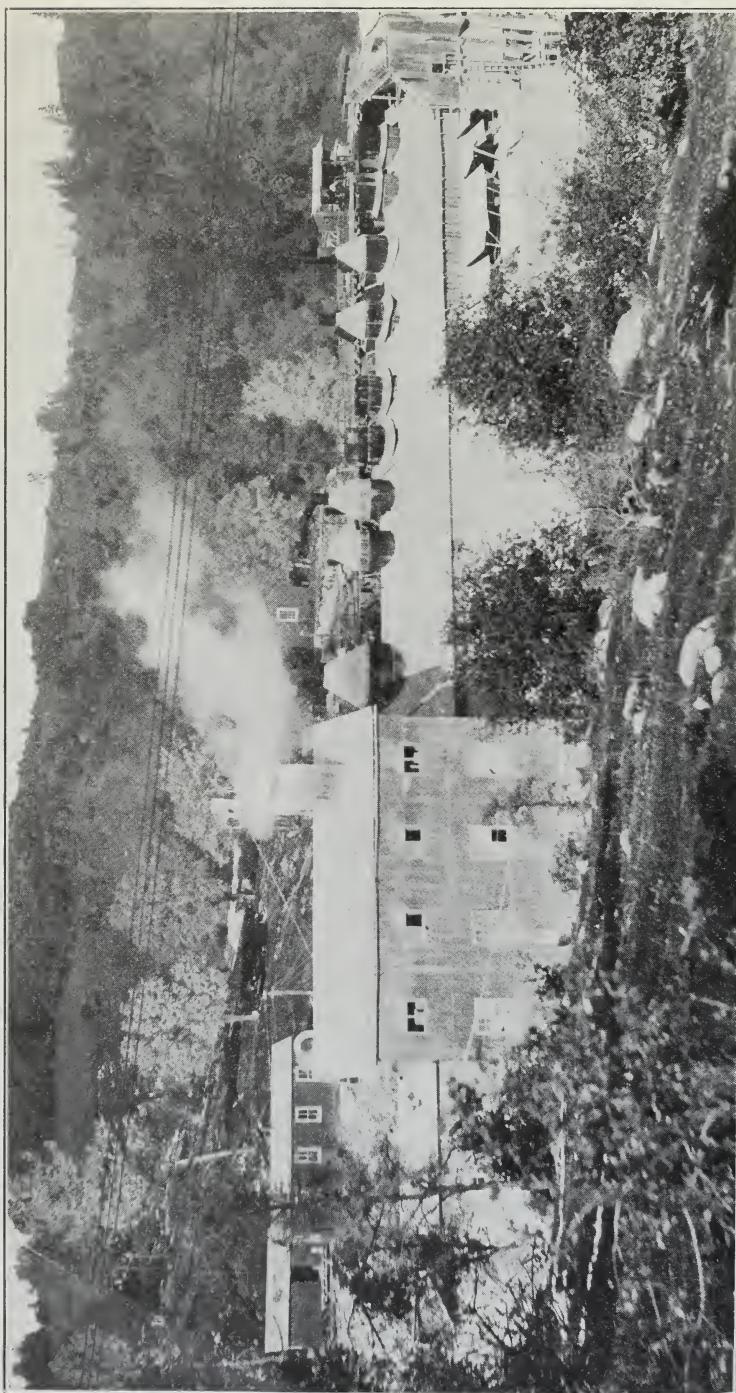
For a few years, beginning in 1865, graphite was mined and shipped from the *Eureka Plumbago Mine* between Columbia and Sonora. The mine was worked by open cuts. Some of the product was sacked as mined, and a part was washed in crude appliances and sun-dried. Chinese labor at \$8 a week per man was employed. The product was shipped to England, and the cost laid down at Liverpool was \$40 a ton. Owners, A. L. Pedro, Columbia, and others.

Other graphite prospects have been noted at the north end of the town of Sonora and near Gold Springs, four miles north of the Eureka deposit. Among these, some work has been done on the *Morgan Graphite* claim, in Sec. 9, T. 2 N., R. 14 E., about three miles west of Columbia. Owner, M. A. Morgan, care Lon P. Fraser, 3042 College Ave., Berkeley.

LIMESTONE.

The county contains immense deposits of limestone and marble which extend from Tuolumne River 12 miles southeast of Sonora, in a westerly and northerly direction, through Sonora and Columbia to Stanislaus River and beyond into Calaveras County. The principal limestone mining operations have been south of Sonora, where the holdings of several small companies have in late years been consolidated by Pacific Lime and Plaster Company, the only operator there at present. The limestone this company is mining appears to contain less magnesium carbonate than that in the Columbia district, and is a pure, coarsely crystalline white and grey stone. The limestone occurs in the Calaveras (Carboniferous) rocks, and the compression and alteration which these comparatively old rocks have undergone has resulted in changing much of the limestone to marble. The marble was at one time quarried at the Maine and Mississippi properties 7½ miles southeast of Sonora, but later operations have been near Columbia. (See under Marble.) So far as known, the stone does not contain sufficient magnesium to be classed as dolomite, but is, properly speaking, magnesian limestone or magnesian marble.

Pacific Lime and Plaster Company. Main office, 58 Sutter Street, San Francisco. Charles M. Cadman, president; John Mocine, resident manager. L. M. Reith is superintendent of the plant one mile south



Plant of Pacific Lime and Plaster Company near Sonora, Tuolumne County.

of Sonora. The land holdings cover 4000 feet along the southern part of a limestone body which extends for several miles passing through Sonora, striking N. 27° W.

The deposit lies between walls of Calaveras (Carboniferous) rocks, and is cut by a number of igneous dikes. For the most part it is a solid, coarsely crystalline deposit of white and light grey limestone with high calcium and low magnesia content, and with very little silica, alumina and iron oxide. So far as opened, only a few small caverns have been encountered. The intrusive dikes appear to have had little effect on the stone, but may serve as boundaries for work in a few places.

The holdings are a consolidation of several smaller ones where various pits were started by former operators. At present, mining is going on at three places. The north quarry (now worked underground entirely through adits) has been opened for 600 feet along the strike and 91 feet deep, with three levels, two of them adits and the lowest reached by a flat incline. The central workings are 70 feet deep with three levels, and have been opened 750 feet along the strike. No. 2 South workings have been opened for a length of 300 feet north and south and 230 feet east and west.

Limestone is mined by opening wide drifts and rooms, leaving pillars, and by top slicing. Large blocks of stone are broken by sledging or by plugging with jackhammer and blasting. Cars are hoisted from the mines to the plant by electric power. Spalls are kept separate from coarse rock. About 150 tons of limestone is mined daily.

Of the 13 upright kilns, ten were in commission at the time of visit December 1. The limestone is in the kilns for 48 hours and in the fire zone, where the temperature goes as high as 2300° to 2400° F., four hours. The kilns are lined with three courses of Stockton firebrick, and the lining lasts 10 to 15 months. From 70 to 80 tons of lime is produced daily. Lump and ground lime are marketed under the trade name 'Acme.'

In the lime hydrate plant, charges of 1200 pounds of crushed lime and 840 pounds of water are mixed 15 minutes and the hydrate is passed through a worm, ground in a Raymond mill and air separated and stored in bins from which it is drawn and bagged. Sierra brand hydrate, the best grade, carries only 1½% to 2% MgO; 99.7% is claimed to pass 100-mesh and 98% to pass 200-mesh. Longspred brand hydrate is slightly coarser, and carries up to 4½% MgO. Eclipse brand is used for cyanide work and for agricultural purposes.

Ground lime, pulverized to 20-mesh, is produced to supply a demand for a quick-slaking lime.

Crushed lime, 1-inch size and smaller, is supplied principally for export. It is shipped in 90-lb. carbide cans to Pacific coast and island ports.

Spalls from the mines are crushed and ground in a hammer mill to 20-mesh, supplying a few users of ground limestone.

Golden Gate-Atlas Materials Company, a separate company, produces mortar from lime made at this plant.

At present 80 men are employed.

MAGNESITE.

Magnesite occurs in the serpentine area in the vicinity of Chinese Camp, and some work has been done on several groups of claims. These have been described in Bulletin 79, 'Magnesite in California'.* All of the claims have remained idle since that was written, and are so at this time.

Gray Eagle Magnesite Co., care Hamilton, Beauchamp and Woodworth, 564 Market St., San Francisco, has a calcining plant (now idle) at Chinese station on the Sierra Railway. Some ore was mined from the *Gray Eagle* claim in Sec. 16, T. 1 S., R. 14 E., two miles from the plant and calcined in this plant. A depth of 98 feet was reached in the mine by adit workings, and a vein eight to ten feet wide was reported. The ore assayed 95% $MgCO_3$.

Monarch and *Mackey* claims were prospects a mile and a mile and a half, respectively, from Chinese Camp.

White Rock Magnesite Mine is in SW $\frac{1}{4}$ of Sec. 6, T. 1 S., R. 14 E. A vein one to two feet wide was prospected by an inclined shaft 60 feet deep, and by short surface cuts at intervals for 1000 feet. Three cars of ore were shipped in 1917, but the claim is idle now.

MARBLE.

Marble at one time was quarried 7 $\frac{1}{2}$ miles south of Sonora, but later operations have been in the large area surrounding Columbia, extending north and northeast of that town into Calaveras County, and having a width of two to four miles. The stone varies from pure white through various degrees of veining to dark grey. It is harder and has a higher specific gravity than many marbles. Its compressive strength is reported to be from 20,000 to 25,000 lb. per cubic inch, which is much higher than that of varieties with which it competes. For a dolomitic stone, it is also fine grained. The magnesium carbonate content runs from 16% to 27% and the silica, alumina and iron oxide contents are very low. The exact depth of the deposits has not been determined, but the deepest shaft in the area, at the Experimental Mine, is 586 feet deep (incline) or over 400 feet vertically, and in limestone. The North Fork of Stanislaus River has also cut a canyon which is 1150 feet lower than Columbia, and entirely in the limestone. Columbia Marble Quarry is the only one now active. Other quarries are the *Bell*, at Columbia, the *Baxter* and *Sonora* quarries between Sonora and Columbia and the *Warren* quarry 3 $\frac{1}{2}$ miles northwest of Columbia.

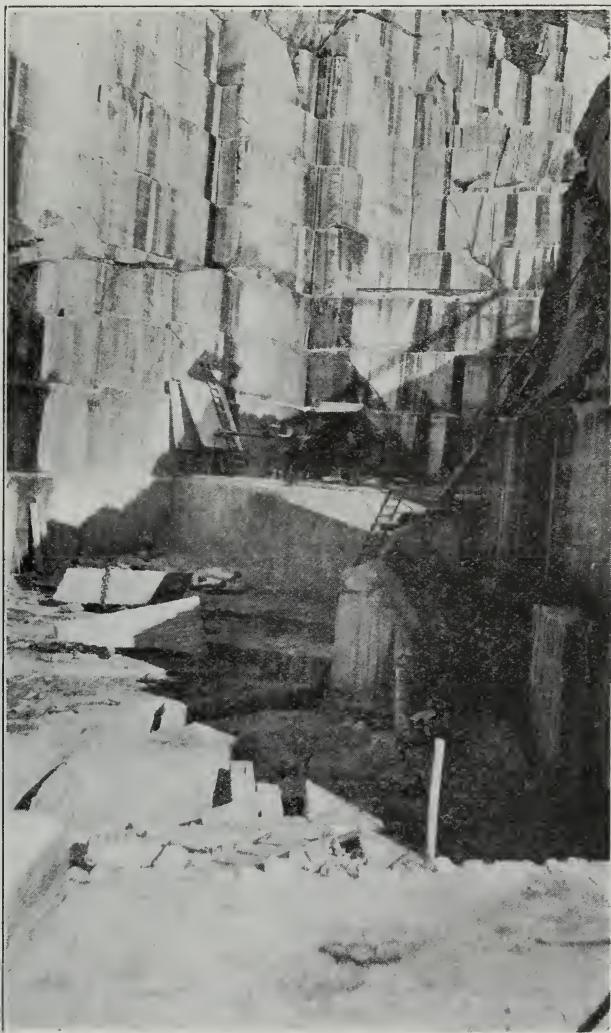
Bell Columbia Marble Company. Office, 114 Sansome St., San Francisco. Property consists of 45 acres covering part of the large dolomitic marble area of Columbia, at the east side of that town. It is five miles by good road from Sonora. Quarrying of marble began in December, 1918, and continued at intervals for several years, but no work has been done for over a year past. There is considerable equipment, including derricks, air compressors, etc., the improvements bearing an assessed valuation of \$38,000.

This company found itself hampered in marketing its marble because

* Calif. State Min. Bur. 1925.

of the lack of a sawing plant and polishing equipment and has been endeavoring to finance these additions. Some waste stone was sold for other uses.

G. Bordoli & Bros., Box 513, Sonora, operate a small quarry beside the road about a mile north of Sonora. The pure white marble is crushed in a rockbreaker to about one-inch size and is shipped for use in terrazzo.



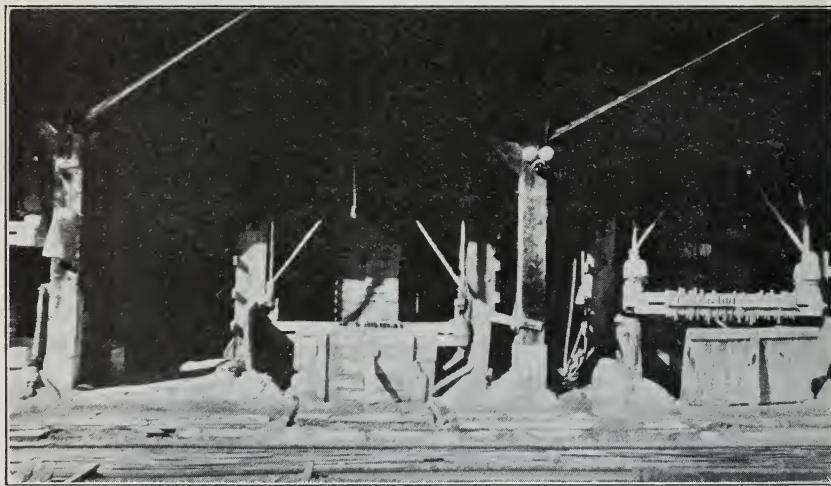
View of Marble Quarry of Columbia Marble Company,
Tuolumne County.

Columbia Marble Company. Main office, 413 Rialto Building, San Francisco. H. R. Van Norden, secretary. The quarry is $2\frac{3}{4}$ miles northeast of Columbia, and on the south side of Stanislaus River, 1100 feet from the old quarry which supplied so much marble. H. J. Toffol, Sonora, manager, and W. D. Bannister, superintendent.

The stone is a handsome and durable dolomitic marble. The principal product is white with blue veining, although other shades, including a beautiful buff stone with reddish veining, called Portola marble, have been quarried. The new pit was opened in 1921 and its situation on the steep slope permits easy drainage and disposal of waste. The



View of Pit of Columbia Marble Company, showing channelling machine in operation.



Gangsaws at Columbia Marble Company's Plant, sawing marble blocks.

marble deposit is 200 feet wide, 500 feet deep and a mile long, and has been estimated to contain over 200,000,000 cubic feet, being part of an immense deposit covering many square miles. The company owns 169 acres.

The channeling machines cut blocks of marble 16 by 12 feet. A row of holes is then drilled horizontally along the bottom of the block which

is broken out by wedges and feathers. The large blocks are then split again into pieces weighing about seven tons each, which are loaded by derrick and hoisted up the inclined track to the gangsaws, which are 1100 feet distant and 250 feet above the quarry. The quarry equipment includes two channeling machines, two electrically operated derricks, two air compressors each operated by a 75-h.p electric motor, and air drills and shop.

There are eight gangsaws, some with 25 saws each. These use steel balls for sawing and cut at the rate of one-fourth inch an hour, requiring about a week to saw through a block. The slabs from the saw are trimmed with an air chisel and go to the rubbing bed. This is of cast iron, 12 feet in diameter, four inches thick and weighs nine tons. It turns 45 to 50 times a minute. The slabs, which are $1\frac{1}{4}$ " thick, are trued up on this bed to exact dimensions, and the rubbing is a sufficient finish for flooring, steps and the like. Monterey sand is used.

Thirty men are employed. Marble is hauled by tractors or trucks to the Sierra Railway at Sonora, a distance of seven miles.

SOAPSTONE AND TALC.

B. Brown, Box 332, Sonora; *W. E. Finch*, Box 583, Sonora; and *A. D. Hunter*, Box 584, Sonora, have all listed deposits of soapstone and tale for sale.

H. Favot, Moccasin P. O., has a large deposit of soapstone and tale about two miles from Hetch Hetchy Railroad in the Moccasin district. It is only slightly developed.

SAN FRANCISCO FIELD DIVISION.

C. McK. LAIZURE, Mining Engineer.

On account of unfinished field work there is no report from the San Francisco Field Division in this issue.

LOS ANGELES FIELD DIVISION.

W. BURLING TUCKER, Mining Engineer.

On account of unfinished field work there is no report from the Los Angeles Field Division in this issue.

OIL FIELD DEVELOPMENT OPERATIONS.

By R. D. Bush, State Oil and Gas Supervisor.

From October 2, 1927, to and including December 31, 1927, the following new wells were reported as ready to drill:

Company	Sec.	Twp.	Range	Well No.	Field
ALAMEDA COUNTY: Livermore Shallow Fields Drilling Co.	22	3	3	1	
FRESNO COUNTY: Standard Oil Co.-----	5	21	15	8	Coalinga
Superior Oil Co.-----	18	21	17	Kennedy 1	
KERN COUNTY: Carneros Oil Co.-----	31	28	21	13	Belridge
Carneros Oil Co.-----	30	28	21	48	Belridge
Carneros Oil Co.-----	30	28	21	83	Belridge
Carneros Oil Co.-----	30	28	21	84	Belridge
Hugh Porter-----	36	28	20	1	Belridge
Bishop Corporation-----	23	28	27	4	Kern River
Bishop Corporation-----	23	28	27	5	Kern River
California Petroleum Corp.-----	26	28	27	Cole 1	Kern River
California Petroleum Corp.-----	23	28	27	Lehmann 2	Kern River
California Petroleum Corp.-----	23	28	27	Lehmann 3	Kern River
California Petroleum Corp.-----	23	28	27	Lehmann 4	Kern River
C. C. M. O. Co.-----	23	28	27	10	Kern River
C. C. M. O. Co.-----	23	28	27	12	Kern River
C. C. M. O. Co.-----	23	28	27	13	Kern River
C. C. M. O. Co.-----	23	28	27	14	Kern River
General Petroleum Corp.-----	14	28	27	20	Kern River
General Petroleum Corp.-----	26	28	27	Sill 14	Kern River
General Petroleum Corp.-----	26	28	27	Sill 15	Kern River
General Petroleum Corp.-----	26	28	27	Sill 16	Kern River
General Petroleum Corp.-----	26	28	27	Sill 30	Kern River
General Petroleum Corp.-----	26	28	27	Sill 36	Kern River
General Petroleum Corp.-----	14	28	27	Wetmore 6	Kern River
General Petroleum Corp.-----	14	28	27	Wetmore 7	Kern River
George F. Getty, Inc.-----	26	28	27	Grady 7	Kern River
George F. Getty, Inc.-----	26	28	27	Lightner 1	Kern River
George F. Getty, Inc.-----	26	28	27	McDougall 1	Kern River
George F. Getty, Inc.-----	26	28	27	McDougall 2	Kern River
George F. Getty, Inc.-----	26	28	27	McDougall 8	Kern River
Kent & Whittier-----	26	28	27	2	Kern River
The Kern River Oilfields of Cal. Ltd.-----	26	28	27	3	Kern River
The Kern River Oilfields of Cal., Ltd.-----	26	28	27	10	Kern River
Petroleum Securities Co.-----	22	28	27	2-B	Kern River
Petroleum Securities Co.-----	22	28	27	3-B	Kern River
Petroleum Securities Co.-----	22	28	27	6	Kern River
Petroleum Securities Co.-----	22	28	27	7	Kern River
Petroleum Securities Co.-----	22	28	27	8	Kern River
Petroleum Securities Co.-----	22	28	27	9	Kern River
The St. Helens Petroleum Co., Ltd.-----	26	28	27	2	Kern River
Standard Oil Co.-----	21	28	27	3	Kern River
Standard Oil Co.-----	27	28	27	13	Kern River
Standard Oil Co.-----	27	28	27	15	Kern River
Standard Oil Co.-----	15	28	27	17	Kern River
Standard Oil Co.-----	15	28	27	18	Kern River
Standard Oil Co.-----	15	28	27	19	Kern River
Standard Oil Co.-----	15	28	27	20	Kern River
Union Oil Co.-----	28	27	28	Tribe 1	Kern River
Wonder Co., Ltd.-----	23	28	27	3	Kern River
Keefe-Morrison, Inc.-----	8	30	22	7	McKittrick
Honolulu Consolidated Oil Co.-----	8	32	24	2	Midway
North American Oil Consolidated-----	32	31	24	13	Midway
Standard Oil Co.-----	3	32	24	35	Midway
Standard Oil Co.-----	29	31	24	51	Midway

OIL FIELD DEVELOPMENT OPERATIONS—Continued.

Company	Sec.	Twp.	Range	Well No.	Field
KERN COUNTY—Continued.					
Standard Oil Co.	19	31	24	92	Midway
Standard Oil Co.	19	31	24	99	Midway
Standard Oil Co.	33	31	24	106	Midway
Western Production Co.	21	31	22	11	Midway
A. Bruce Frame	18	26	28	Dominion 1	Mt. Poso
General Petroleum Corp.	21	27	28	Glide 21 1	Mt. Poso
Superior Oil Co.	11	26	27	Smith 1	Mt. Poso
Exeter Oil Co.	1	29	20	Parry 1	Temblor
R. B. Jackson & C. H. Chamberlain	36	29	20	1	Temblor
Herbert Moore	11	29	20	1	Temblor
Selegna Investment Co.	36	29	20	Selegna 1	Temblor
Standard Oil Co.	27	11	20	Kern Co. Lease No. 2 31	Wheeler Ridge
Standard Oil Co.	27	11	20	Kern Co. Lease No. 2 32	Wheeler Ridge
Associated Oil Co.	34	28	29	Harvey 1	-----
Brown-Hammond Oil & Tool Co.	14	11	9	1	-----
California Petroleum Corp.	26	27	28	Glide 1	-----
Pearl Durnal	32	27	29	1	-----
Elbe Oil Land Development Co.	20	28	29	1	-----
Midway Northern Oil Co.	29	29	30	Brown 1	-----
Milham Exploration Co.	8	28	23	2	-----
Selegna Investment Co.	9	11	24	1	-----
Shell Co.	29	28	29	Jewett 1	-----
KINGS COUNTY:					
Monocline Development Co.	7	21	21	1	-----
LOS ANGELES COUNTY:					
Brownmoor Oil Co.	7	2	14	8	Inglewood
Standard Oil Co.	17	2	14	Baldwin-Cienega 55	Inglewood
Standard Oil Co.	17	2	14	Baldwin-Cienega 63	Inglewood
Bellview Oil Syndicate	29	4	12	1	Long Beach
Biltmore Petroleum Corp.	29	4	12	1	Long Beach
Bolsa Chica Oil Corp.	30	4	12	Mutual 4	Long Beach
Bush-Voorhis Oil Co.	19	4	12	22	Long Beach
California Eastern Oil Co.	29	4	12	E. B. Campbell 1	Long Beach
California Eastern Oil Co.	29	4	12	Paulsen 1	Long Beach
California Petroleum Corp.	29	4	12	Brown 3	Long Beach
California Petroleum Corp.	19	4	12	Davidson 7	Long Beach
California Petroleum Corp.	19	4	12	Davidson 8	Long Beach
California Petroleum Corp.	29	4	12	Ellis 2	Long Beach
California Petroleum Corp.	29	4	12	Flower State 2	Long Beach
California Petroleum Corp.	29	4	12	Griswold One 2	Long Beach
California Petroleum Corp.	19	4	12	Harlow 9	Long Beach
California Petroleum Corp.	19	4	12	Lewis 2	Long Beach
California Petroleum Corp.	29	4	12	McDavid 3	Long Beach
California Petroleum Corp.	19	4	12	Neece 3	Long Beach
California Petroleum Corp.	30	4	12	Reedy DuBois 2	Long Beach
California Petroleum Corp.	29	4	12	Robinson 4	Long Beach
California Petroleum Corp.	30	4	12	Shilling 4	Long Beach
California Western Oil Co.	19	4	12	Darby 3	Long Beach
California Western Oil Co.	19	4	12	Darby 4	Long Beach
E. B. Campbell	29	4	12	3	Long Beach
E. B. Campbell	29	4	12	4	Long Beach
Tom J. Cannon	29	4	12	Jones 2	Long Beach
Continental Oil Co.	19	4	12	Modoc 1	Long Beach
Continental Oil Co.	19	4	12	Taylor 1	Long Beach
Crown City Oil Co.	29	4	12	2	Long Beach
Dabney-Johnston Oil Corp.	30	4	12	4	Long Beach
Delaney Petroleum Corp.	19	4	12	Alsop 1	Long Beach
Delaney Petroleum Corp.	19	4	12	Harlow 2	Long Beach

OIL FIELD DEVELOPMENT OPERATIONS—Continued.

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Cont.					
Delaney Petroleum Corp.	29	4	12	Hart 1	Long Beach
L. T. Edwards	28	4	12	Bradley 1	Long Beach
L. T. Edwards	30	4	12	Brayton 2	Long Beach
L. T. Edwards	30	4	12	Brayton 3	Long Beach
Freeman Oil Syndicate	29	4	12	1	Long Beach
General Petroleum Corp.	19	4	12	Black &	
General Petroleum Corp.	19	4	12	Drake 3	Long Beach
General Petroleum Corp.	19	4	12	Clock 4	Long Beach
General Petroleum Corp.	19	4	12	Jonah 5	Long Beach
General Petroleum Corp.	19	4	12	K & H 8	Long Beach
General Petroleum Corp.	19	4	12	Signal 2	Long Beach
George F. Getty, Inc.	30	4	12	L. B. 17	Long Beach
George F. Getty, Inc.	30	4	12	L. B. 17	Long Beach
George F. Getty, Inc. and J. Paul Getty	19	4	12	L. B. 21	Long Beach
George F. Getty, Inc. and J. Paul Getty	19	4	12	L. B. 22	Long Beach
George F. Getty, Inc. and J. Paul Getty	19	4	12	L. B. 23	Long Beach
George F. Getty, Inc. and J. Paul Getty	20	4	12	L. B. 24	Long Beach
Graham-Loftus Oil Co.	19	4	12	Mack 1	Long Beach
Herndon Petroleum Corp.	28	4	12	Herndon 4	Long Beach
Herndon Petroleum Corp.	29	4	12	Herndon 5	Long Beach
A. T. Jergins Syndicate, Inc.	29	4	12	3	Long Beach
A. T. Jergins Trust	19	4	12	22	Long Beach
A. T. Jergins Trust	19	4	12	23	Long Beach
A. S. Johnston Drilling Corp.	30	4	12	3	Long Beach
A. S. Johnston Drilling Corp.	30	4	12	6	Long Beach
Marine Corp.	19	4	12	28-A	Long Beach
McKeon Drilling Co., Inc.	30	4	12	Ellis 1	Long Beach
McKeon Drilling Co., Inc.	29	4	12	Macrate 1	Long Beach
McKeon Drilling Co., Inc.	30	4	12	Thorne 1	Long Beach
Miley Oil Co.	30	4	12	Miley-	
J. E. O'Donnell	29	4	12	Dabney 1	Long Beach
J. E. O'Donnell	29	4	12	O'Donnell 62	Long Beach
J. E. O'Donnell	29	4	12	O'Donnell 63	Long Beach
J. E. O'Donnell	29	4	12	O'Donnell 64	Long Beach
Pan American Petroleum Co.	30	4	12	O'Donnell 65	Long Beach
Pan American Petroleum Co.	29	4	12	Chainey 4	Long Beach
Rainbow Petroleum Co.	29	4	12	McKeon 3	Long Beach
Richfield Oil Co.	29	4	12	12	Long Beach
Richfield Oil Co.	29	4	12	Denni 6	Long Beach
Richfield Oil Co.	29	4	12	Green 4	Long Beach
Richfield Oil Co.	29	4	12	Green 5	Long Beach
Richfield Oil Co.	29	4	12	Green 6	Long Beach
Richfield Oil Co.	30	4	12	Hass 15	Long Beach
Richfield Oil Co.	30	4	12	Hass 16	Long Beach
Richfield Oil Co.	30	4	12	Hass 17	Long Beach
Richfield Oil Co.	29	4	12	Monrovia 3	Long Beach
Richfield Oil Co.	29	4	12	Warren &	
Rio Grande Oil Co.	29	4	12	Macrate 4	Long Beach
Rio Grande Oil Co.	29	4	12	A-3	Long Beach
Shell Co.	29	4	12	Flower State 2	Long Beach
Shell Co.	29	4	12	Alamitos 25	Long Beach
Shell Co.	29	4	12	Alamitos 26	Long Beach
Shell Co.	29	4	12	Alamitos 27	Long Beach
Shell Co.	29	4	12	Alamitos 28	Long Beach
Shell Co.	29	4	12	Alamitos 29	Long Beach
Shell Co.	29	4	12	Alamitos 30	Long Beach
Shell Co.	29	4	12	Alamitos 31	Long Beach
Shell Co.	29	4	12	Alamitos 32	Long Beach
Shell Co.	29	4	12	Binkley 3	Long Beach
Shell Co.	29	4	12	Hutton	
Shell Co.	29	4	12	Comm. 7	Long Beach
Shell Co.	29	4	12	Martin	
Shell Co.	29	4	12	Comm. 4	Long Beach
Shell Co.	29	4	12	Nesa 7	Long Beach

OIL FIELD DEVELOPMENT OPERATIONS—Continued.

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Cont.					
Shell Co.	29	4	12	Patton-	
Signal Syndicate No. 4	19	4	12	Wilson 5	Long Beach
The State Co., Inc.	30	4	12	7	Long Beach
Superior Oil Co.	19	4	12	1	Long Beach
Superior Oil Co.	19	4	12	Britton 3	Long Beach
Superior Oil Co.	19	4	12	Britton 4	Long Beach
Superior Oil Co.	29	4	12	Crew 3	Long Beach
Superior Oil Co.	29	4	12	Crew 4	Long Beach
Superior Oil Co.	29	4	12	Harlan 2	Long Beach
Travis Drilling Co.	30	4	12	Sales 2	Long Beach
Travis Drilling Co.	29	4	12	Travis 2	Long Beach
Union Oil Co.	30	4	12	Long Beach	
Union Oil Co.	30	4	12	Comm. 16	Long Beach
Union Oil Co.	30	4	12	Long Beach	
Union Oil Co.	30	4	12	Comm. 17	Long Beach
Union Oil Co.	30	4	12	Long Beach	
Union Oil Co.	30	4	12	Comm. 18	Long Beach
Universal Consolidated Oil Co.	29	4	12	Long Beach	
Universal Consolidated Oil Co.	29	4	12	Comm. 20	Long Beach
V. R. G. Wilbur	19	4	12	Graham 1	Long Beach
St. Helens-Riverside Properties	2	2	12	Stoll 1	Long Beach
Standard Oil Co.	2	2	12	Bergstrom 2	Long Beach
Union Oil Co.	17	3	13	Monterey 16	Montebello
George F. Getty, Inc.	14	5	12	Benedictine 2	Montebello
Standard Oil Co.	3	5	12	Padelford 4	Rosecrans
Union Drilling & Petroleum Co.	3	5	12	S. B. 15	Seal Beach
White Oil Co.	3	5	12	San Gabriel 16	Seal Beach
C. C. M. O. Co.	10	4	14	Thompson 1	Seal Beach
Otis G. Andrews & Sons	28	8	13	Torrance 91	Seal Beach
Associated Oil Co.	13	2	12	Patterson 1	Torrance
A. A. Craig	11	3	13	1	
Hurst Oil Corp.	28	2	14	1	
James Mayzie	20	5	17	Simons 1	
James Mayzie				1	
ORANGE COUNTY:					
Brea Canon Oil Co.	1	3	10		
Union Oil Co.	1	3	10	43	Brea-Olinda
Chiksan Oil Co.	19	3	9	Stearns 71	Brea-Olinda
Holly Development Co.	20	3	9	Yorba 1	Coyote Hills
Shell Co.	22	3	10	Lehmer 1	Coyote Hills
Abel, Rosenberg & Lowis	10	6	11	Stern 1 1	Coyote Hills
Beil of Montebello Oil Co.	2	6	11	1	Huntington Beach
F. W. Bishop	10	6	11	7	Huntington Beach
Allen Brown	10	6	11	1	Huntington Beach
California Petroleum Corp.	27	5	11	4	Huntington Beach
California Petroleum Corp.	10	6	11	Buck 8	Huntington Beach
A. G. Deck	10	6	11	Fee 4	Huntington Beach
Deck-Camp No. 1	10	6	11	Deck 1	Huntington Beach
Duel Petroleum Co.	36	5	11	1	Huntington Beach
Duncan & Lea Petroleum Corp.	10	6	11	1	Huntington Beach
Dunn-Christensen	10	6	11	3	Huntington Beach
E. A. Fennell Co., Inc.	10	6	11	Dunn-	
J. F. Garliepp	10	6	11	Christensen 1	Huntington Beach
F. E. Hurley	34	5	11	2-A	Huntington Beach
C. L. Hussey	10	6	11	Andrews 2	Huntington Beach
S. W. Lea	10	6	11	Slater 1	Huntington Beach
Loftin Oil Co.	10	6	11	2	Huntington Beach
M. W. McVey	10	6	11	3	Huntington Beach
Miller Oil Co.	10	6	11	McVey 2	Huntington Beach
Miller & Van Alen	10	6	11	Community 1	Huntington Beach
John Morris	10	6	11	Miller-Van	
Ben F. Mun	10	6	11	Alen 1	Huntington Beach
Ben F. Mun	10	6	11	1	Huntington Beach
Ben F. Mun	10	6	11	Mun 3	Huntington Beach
				Mun 4	Huntington Beach
				Mun 6	Huntington Beach

OIL FIELD DEVELOPMENT OPERATIONS—Continued.

Company	Sec.	Twp.	Range	Well No.	Field
ORANGE COUNTY—Continued.					
Ben F. Mun.	10	6	11	Mun 7	Huntington Beach
Ben F. Mun.	10	6	11	Mun 8	Huntington Beach
Ben F. Mun.	10	6	11	Mun 9	Huntington Beach
Ben F. Mun.	10	6	11	Mun 10	Huntington Beach
Pacific Coast Oil Co.	10	6	11	Lippencall 1	Huntington Beach
Paul and Collier	10	6	11	1	Huntington Beach
M. J. Pettijohn	10	6	11	1	Huntington Beach
Frank Sanders	10	6	11	1	Huntington Beach
Standard Oil Co.	34	5	11	Bolsa 32	Huntington Beach
Standard Oil Co.	34	5	11	Bolsa 33	Huntington Beach
Standard Oil Co.	4	6	11	Huntington Beach 60	Huntington Beach
Western Drilling & Producing Co.	10	6	11	Humphrey's 1	Huntington Beach
Western Ibbetson	10	6	11	Western Ibbetson 22	Huntington Beach
Sy Wicker	10	6	11	Bundy 3	Huntington Beach
Interstate Oil Corp.	17	6	10	Norris 1-A	Newport
Mesa Petroleum Corp.	21	6	10	B. & G. 1	Newport
Petroleum Securities Co.	3	6	10	Fairview 1	Newport
Standard Oil Co.	34	3	9	R. Locke 2	Richfield
Standard Oil Co.	34	3	9	L. Vejar 3	Richfield
Union Oil Co.	33	3	9	Stern 5	Richfield
Union Oil Co.	33	3	9	Stern 12	Richfield
Union Oil Co.	34	3	9	Yorba Linda Group 17	Richfield
SAN BERNARDINO COUNTY					
J. W. McPearson	25	1	2	1	-----
L. B. Riggins	6	3	7	1	-----
SAN DIEGO COUNTY:					
Davenport Oil & Gas Development Co.	12	2		1	-----
Mills Oil Co.	Pueblo Lot 1	316		1	-----
Stanley S. Turner	Rinc on del	Diablo		1	-----
SAN LUIS OBISPO COUNTY:					
Miley Oil Co.	15	29	17	1	-----
Union Oil Co.	34	32	15	Rust 1	-----
SAN MATEO COUNTY:					
Morris Schwartz	19	9	4	1	-----
SANTA BARBARA COUNTY:					
George A. Gorham	33	10	34	Gorham 1	Casmalia
Magenheimer Securities Corp.	30	9	32	1	Cat Canyon
Palmer Union Oil Co.	30	9	32	Stendel 14	Cat Canyon
R. & G. Oil Co.	32	9	32	1	Cat Canyon
R. & G. Oil Co.	30	9	32	7	Cat Canyon
Barnsdall Oil Co.	1	4	30	Edwards 2	Goleta
Santa Barbara Oil Co.	2	4	29	Ellwood 1	Goleta
Santa Barbara Oil Co.	3	4	29	Hollister 6-A	Goleta
Santa Barbara Oil Co.	3	4	29	Hollister 3-B	Goleta
H. M. Gilliam	2	4	28	1	-----
Tepusquet Oil Co.	---	9	32	1	-----
The Twin State Oil Co.	---	4	27	1	-----
SANTA CLARA COUNTY:					
Continental Oil Co.	11	11	4	2	-----
SONOMA COUNTY:					
Mortara Oil Co.	8	9	8	1	-----
Shell Co.	---	5	6	Mossi 1	-----
VENTURA COUNTY:					
J. W. Hackworth	11	4	23	Herbert Tareyton 1	Ojai
Continental Oil Co.	36	4	18	4	Piru
W. H. Geis	36	4	18	3	Piru
J. B. Hedrick	33	4	18	1-A	Piru

OIL FIELD DEVELOPMENT OPERATIONS—Continued.

Company	Sec.	Twp.	Range	Well No.	Field
VENTURA COUNTY—Continued.					
Robert B. Moran	2	4	19	1	Piru
Schell & Jennings	32	4	18	11	Piru
C. C. M. O. Co.	17	3	24	Hobson C-1	Rincon
C. C. M. O. Co.	17	3	24	Hobson C-2	Rincon
C. C. M. O. Co.	17	3	24	Hobson C-3	Rincon
C. C. M. O. Co.	17	3	24	Hobson C-4	Rincon
General Petroleum Corp.	8	3	24	Hobson A-1	Rincon
General Petroleum Corp.	8	3	24	Tomson 1	Rincon
E. J. Miley	17	3	24	Henry & Hamilton 1	Rincon
E. J. Miley	17	3	24	Henry & Hamilton 2	Rincon
E. J. Miley	17	3	24	Henry & Hamilton 3	Rincon
Pan American Petroleum Co.	17	3	24	Hobson Fec 1	Rincon
Pan American Petroleum Co.	17	3	24	Hobson Fee 2	Rincon
Pan American Petroleum Co.	17	3	24	Hobson Fee 3	Rincon
Pan American Petroleum Co.	8	3	24	Hobson Fee 4	Rincon
Pan American Petroleum Co.	17	3	24	State 2	Rincon
Petroleum Exploration Co.	17	3	24	1	Rincon
Southern Pacific Land Co.	17	3	24	1	Rincon
Ellis Lockwood & Howard Barmore	1	4	20	6	Sespe
Superior Oil Co.	33	4	20	Sespe 1	Sespe
Shell Co.	6	2	18	Strathearn 1	Simi
Oak Ridge Oil Co.	13	3	21	Harvey 22	South Mountain
Oak Ridge Oil Co.	18	3	20	Willard 25	South Mountain
Union Oil Co.	13	3	21	Caldwell & Snyder 2	South Mountain
Associated Oil Co.	22	3	23	Hartman 11	Ventura
Associated Oil Co.	27	3	23	Lloyd 24	Ventura
Associated Oil Co.	22	3	23	Lloyd 35	Ventura
Associated Oil Co.	27	3	23	Lloyd 52	Ventura
Associated Oil Co.	23	3	23	Lloyd 100	Ventura
Associated Oil Co.	23	3	23	V. L. & W. 3	Ventura
Associated Oil Co.	23	3	23	V. L. & W. 4	Ventura
Associated Oil Co.	26	3	23	V. L. & W. 5	Ventura
M. K. T. Oil Co.	28	3	23	Foster 1	Ventura
Petroleum Securities Co.	28	3	23	Orton 6	Ventura
Petroleum Securities Co.	28	3	23	Orton 7	Ventura
Shell Co.	28	3	23	Edison 20	Ventura
Shell Co.	28	3	23	Edison 21	Ventura
Shell Co.	28	3	23	Edison 22	Ventura
Shell Co.	28	3	23	Edison 23	Ventura
Shell Co.	28	3	23	Taylor 25	Ventura
Shell Co.	28	3	23	Taylor 26	Ventura
Star Petroleum Co.	13	3	23	Star-Canet 1-A	Ventura
Freres & Miller	11	1	20	Conejo 1	-----
Standard Oil Co.	15	2	22	Saticoy- Citrus 1	-----
Standard Oil Co.	15	2	22	Saticoy- Citrus 2	-----

ADMINISTRATIVE DIVISION.

Personnel. WALTER W. BRADLEY, Deputy State Mineralogist.

There have been no changes of personnel to be noted during the past quarter.

New Publications.

During the quarterly period covered by this issue, the following publications of the Division of Mines and Mining have been made available for distribution:

Bulletin No.100, "California Mineral Production for 1926," by Walter W. Bradley, 175 pages, illustrated with 7 half-tones and 7 line-cuts (maps and charts). Distributed without charge.

Summary of Operations, California Oil Fields, Vol. 12, No. 12, June, 1927; and Vol. 13, Nos. 1 and 2, July and August, 1927, respectively. These contain articles on: 'Recent Developments in the Huntington Beach Oil Field'; 'Some Improvements in Fishing Tools and Devices used in Rotary Drilling'; 'Production Statistics of California Oil Fields, and Directory of California Oil Operators,' respectively.

Commercial Mineral Notes; Nos. 56, 57, 58, November, December, 1927 and January, 1928, respectively. These 'notes' carry the lists of 'mineral deposits wanted' and 'minerals for sale' issued in the form of a mimeographed sheet monthly. It is mailed free to those on the mailing list for 'Mining in California.'

Mails and Files.

The Division of Mines maintains, in addition to its correspondence files and the library, a mine file which includes original reports on the various mines and mineral properties of all kinds in California.

During each quarterly period there are several thousand letters received and answered at the San Francisco office alone, covering almost every phase of prospecting, mining, and developing mineral deposits, reduction problems, marketing of refined products, and mining law. In addition to this, hundreds of oral questions are answered daily both at the main office and the district offices, for the many inquirers who come in for personal interviews and to consult the files and library.



DIVISION OF MINERALS AND STATISTICS.

Statistics, Museum, Laboratory.

WALTER W. BRADLEY, Deputy State Mineralogist.

CALIFORNIA'S MINERAL PRODUCTION IN 1927.

Estimate of 1927 Output.

The total value of the mineral production of California for the year 1927 just closed, is conservatively estimated by the statistical division to have been approximately \$377,205,000. This is, in part, detailed in the tabulation below; but, as there are more than fifty mineral substances on California's commercial list, it is impracticable at this early date to obtain definite figures on other than the more important items. The blank report forms are being mailed to the operators in all mineral lines, and the date of publication of the final detailed and complete report will depend upon the promptness of their replies.

The estimated total of \$377,205,000 is a decrease of approximately \$73,000,000 from the value of the 1926 production which was the highest total on record for any year in the state. The drop is due mainly to petroleum, and in smaller measure to copper, zinc, silver, and lead. Although there was an increase of approximately 6,000,000 barrels in the quantity of crude oil, the total value will probably show around \$65,000,000 less, owing to a sharp cut in the prices effective April 16, 1927, particularly on the grades above 20° Baumé. In the case of crudes above 40° Baumé in the Athens-Rosecrans-Dominguez fields the cut amounted to 50% of the previous price. Around 85% of the crude oil at present produced in California is above 20° B., some testing as high as 50° B.; while the low-grade ranges down to 9° B. Current prices range from 75¢ per barrel for 14°–20° crude in the San Joaquin Valley fields to \$1.36 for 43° crude in the Athens-Rosecrans-Dominguez section.

Receipts of bullion at the mint and smelters show a decrease in gold yield of about \$200,000 compared with 1926, the drop being chargeable to the lode mines, as the dredges bettered their output of the previous year. The drop in silver yield is due to smaller shipments of copper, lead, and zinc ores. There was an increased output of about 1500 flasks of quicksilver, and the average price was \$117 compared with \$87.64 in 1926, quotations closing the year at \$128 per flask.

Among the structural, industrial and saline groups there were no notable changes to report, with the possible exception of magnesite which showed a smaller quantity shipped, but with unit prices practically stationary.

The estimated quantities and values for 1927 are as follows:

\$11,710,000	gold.
890,000	(1,570,000 fine oz.) silver.
3,475,000	(26,800,000 lbs.) copper.
172,000	(2,540,000 lbs.) lead.
518,000	(8,250,000 lbs.) zinc.
876,000	(7,400 flasks) quicksilver.
350,000	other metals, including antimony, iron, manganese, platinum, tungsten.
280,000,000	(230,750,000 bbl.) petroleum.
19,000,000	(220,000,000 M. cu. ft.) natural gas.
24,000,000	(13,000,000 bbl.) cement.
18,500,000	crushed rock, sand and gravel.
6,500,000	brick and hollow building tile.
464,000	(40,000 tons, crude) magnesite.
1,250,000	other structural materials, including granite, et al.
4,500,000	miscellaneous 'industrial' minerals.
5,000,000	salines, including borates, potash, salt, et al.

\$377,205,000 total value.

MUSEUM.

The Museum of the State Division of Mines and Mining possesses an exceptionally fine collection of rocks and minerals of both economic and academic value. It ranks among the first five of such collections in North America; and contains not only specimens of most of the known minerals found in California, but much valuable and interesting material from other states and foreign countries as well.

Mineral specimens suitable for exhibit purposes are solicited, and their donation will be appreciated by the State Division of Mines and Mining as well as by those who utilize the facilities of the collection.

The exhibit is daily visited by engineers, students, business men and prospectors as well as tourists and mere sightseers. Besides its practical use in the economic development of California's mineral resources, the collection is a most valuable educational asset to the state and to San Francisco.

LABORATORY.

FRANK SANBORN, Mineral Technologist.

Approximately thirty samples per day are received and determined at the laboratory of the Division of Mines and Mining. These determinations are made without cost to the senders. Ordinarily a small sample weighing not over a pound is required in making a determination, but it should be in the unground lump form, if possible. When the precious metals—gold, silver, platinum, etc., are suspected, larger samples should be submitted. The size of the deposit is often of importance in determining the commercial value of a mineral and when possible a statement regarding the extent of the orebody should be made. For instance, a good grade of limestone would probably mean little if the deposit were small, but if the limestone deposit should be extremely large and not far from rail transportation, such a deposit might have commercial possibilities.

The importance of the non-metallic minerals is continually increasing, there now being over fifty minerals of commercial value mined in this state. Therefore, prospectors should have any rock identified that appears to be different than the ordinary country rock.

LIBRARY.

E. A. LOWE, Librarian.

In addition to the numerous standard works, authoritative information on many phases of the mining and mineral industry is constantly being issued in the form of reports and bulletins by various government agencies.

The library of the Division of Mines and Mining contains some five thousand selected volumes on mines, mining and allied subjects, and it is also a repository for reports and bulletins of the technical departments of federal and state governments and of educational institutions, both domestic and foreign.

It is not the dearth of the latter publications, but rather a lack of knowledge of just what has been published and where the reports may be consulted or obtained, that embarrasses the ordinary person seeking specific information.

To assist in making the public acquainted with this valuable source of current technical information, 'Mining in California' contains under this heading a list of all books and official reports and bulletins received, with names of publishers or issuing departments.

Files of all the leading technical journals will be found in the library, and county and state maps, topographical sheets and geological folios. Current copies of local newspapers published in the mining centers of the state are available for reference.

The library and reading room are open to the public during the usual office hours, when the librarian may be freely called upon for all necessary assistance.

OFFICIAL PUBLICATIONS RECEIVED.

Governmental.

U. S. Geological Survey:

Bulletins:

- 795-E—Quicksilver Deposits of the Pilot Mountains, Mineral County, Nevada. By Wm. F. Foshag.
- 795-D—The Brown Iron Ores of the West-Middle Tennessee. By Ernest F. Burchard.
- 796-A—The Gillette Coal Field, Northeastern Wyoming. By C. E. Dobbin and V. H. Barnett.
- 795-G—The Brown Iron Ores of Middle Tennessee. By Ernest F. Burchard.

Professional Papers:

- 150-B—The Scaphites and Upper Cretaceous Ammenonite Group. . By John B. Reeside, Jr.
- 150-A—Cephalopods from the Lower Part of the Cody Shale of Oregon Basin, Wyoming. By John B. Reeside, Jr.
- 151 —The Cephalopods of the Eagle Sandstone and Related Formations in the Western Interior of the United States. By John B. Reeside, Jr.
- 141 —Upper Triassic Marine Invertebrate Faunas of North America. By James Perrin Smith.

Water Supply Papers:

- 596-E—Quality of the Surface Waters of New Jersey. By W. D. Collins and C. S. Howard.
- 596-F—Laboratory Tests on Physical Properties of Water-Bearing Materials. By Norah Dowell Stearns.
- 795-F—The Gilbert District, Nevada. By Henry G. Ferguson.

U. S. Bureau of Mines:

Technical Papers:

- 323-B—United States Specifications No. 11D. United States Master Specifications for Lubricants and Liquid Fuels and Methods for Sampling and Testing.
- 419—Safe practices at Oil Derricks. By H. C. Miller.
- 407—Development, Mining and Handling of Ore in Folded and Faulted Areas, Red Iron Ore Mines, Birmingham District, Alabama. By W. R. Crane.

Bulletin 278—Magnetic Concentration of Iron Ores of Alabama. By Oscar Lee, B. W. Candrud and F. D. DeVaney.

Annual Report of the Director to the Secretary of Commerce for Fiscal Year Ended June 30, 1927.

Mineral Resources of the United States:

- Lime in 1926.
- Natural Gas in 1926.
- Clay in 1926.
- Arsenic in 1926.
- Asphalt and Related Bitumens in 1926.
- Salt, Bromine and Calcium Chloride in 1926.
- Slate in 1926.
- Tin in 1926.
- Barytes and Barium Products in 1926.
- Antimony in 1926.
- Potash in 1926.
- Gold, Silver, Copper, Lead and Zinc in the Eastern States in 1926.
- Gold, Silver, Copper, Lead and Zinc in Colorado.
- Iron Ore, Pig Iron and Steel in 1926.
- Gold and Silver in 1925.
- Manganese and Manganiferous Ores in 1926.
- Asbestos in 1926.
- Mercury in 1926.
- Feldspar in 1926.
- Magnesium and Its Compounds in 1926.
- Silica in 1926.
- Natural Gas-Gasoline in 1926.
- Gypsum in 1926.

Reports of Investigations:

Serial No.

- 2832—Comparison of Oils Derived from Coal and from Oil Shale. By Joseph W. Horne and Arthur D. Bauer.
- 2833—Some Methods of Producing Flowing Wells in the Salt Creek Field and Their Effect on Gas-Oil Ratios. By K. B. Nowels.
- 2834—Reduction of Breathing Losses from Vapor-Tight Lease Tanks. By Ludwig Schmidt.
- 2835—Coal-Mine Fatalities in September, 1927. By W. W. Adams.
- 2836—Consumption of Explosives in September, 1927. By W. W. Adams.
- 2837—The Study of an Intermediate Base Crude Oil. By H. M. Smith.
- 2838—Safety Measures Save Lives in Colorado Explosion. By E. H. Denny.
- 2839—Development of Some Fundamentals in the Ferric Sulphate-Sulphuric Acid Process. By Frank S. Wartman and Harmon E. Keyes.
- 2840—The Carburetion of Combustible Gas with Butane and Propane-Butane Mixtures with Particular Reference to the Carburetion of Water Gas. By Wm. W. Odell.
- 2841—Coal-Mine Fatalities in October, 1927. By W. W. Adams.
- 2842—Consumption of Explosives in October, 1927. By W. W. Adams.

Information Circulars:

Circular No.

- 6049—Railroad Fuel Oil Consumption in 1926. By Arthur Huber Redfield.
- 6050—Sources and Distribution of Major Petroleum Products Atlantic Coast States—1926. By E. B. Swanson.
- 6051—Permissible Explosives defined. By Charles E. Munroe.

- 6052—Mine Safety as Affected by Electrification. By K. L. Marshall.
 6053—Regulations and Inspection Prevent Accidents from Falls of Roof. By J. W. Paul.
 6054—Practical Underground Education of the Coal Miner. By G. W. Grove.
 6055—Some Phases of Accident Prevention in Industry. By Arthur L. Murray.
- Secretary of the Interior—Annual Report for the Fiscal Year 1926.
- U. S. Coast and Geodetic Survey:
 Seismological Report, January, February and March, 1926.
 Serial No. 396—Magnetic Declination in California and Nevada in 1927. By W. N. McFarland.
 Annual Report of the Director to the Secretary of Commerce for the Fiscal Year Ended June 30, 1927.
- U. S. Mint—Report of the Director for the Fiscal Year Ended June 30, 1927.
- Library of Congress—Report of the Librarian for the Fiscal Year Ended June 30, 1927.
- California Department of Public Works, Division of Engineering and Irrigation: Bulletin 12—Summary Report on the Water Resources of California and Coordinated Plan for their Development. By Paul Bailey.
- Illinois Geological Survey:
 The Story of the Geologic Making of Southern Illinois. By Stuart Weller.
 Report of Investigations No. 14—Present Status of Correlation of Illinois Coals. By Harold E. Culver.
- Kentucky Geological Survey: Molding Sands-Cement Materials. By Chas. Henry Richardson—Geology of the Middlesboro Basin. By Chester Kenneth Wentworth.
- Missouri Bureau of Geology and Mines: Water Resources of Missouri, 1857–1926. By H. C. Beckman.
- North Carolina Department of Conservation and Development: Economic Paper 60—The Mineral Industry in North Carolina for 1924 and 1925.
 Bulletin 35—Fishing in North Carolina.
- Oklahoma Geological Survey: Bulletin 43—Oil Sands and Productions Relations. By H. C. George and W. F. Cloud.
- Pennsylvania Department of Forests and Waters: Report of.

Societies and Educational Institutions.

- Engineering Society of Western Pennsylvania—Proceedings of, Vol. 43, No. 6.
 Institution of Mining and Metallurgy: Bulletin 277. Bulletin 278.
 National Research Council: Researches in Sedimentation in 1926–1927.
 New York Academy of Sciences: Annals of the, Vol. 29—Relativity and the Motion of Mercury. By Chas. Lane Poor.
 Vol. 30—Nubbin, a Compound Chromosomal Type in *Datura*. By Albert Francis Blakesley.
 Vol. 30.—The Value of Life History Data in the Study of the Evolution of the Amphibia. By G. K. Noble.
- Western Society of Engineers, Journal of, Vol. 32, No. 9.
 American Mineralogist, The, Vol. 12, No. 11.
 Economic Geology, Vol. 22, No. 7. Vol. 22, No. 8.
 U. S. National Museum, Proceedings of the, Vol. 72, Article 21—The Oxidation of Meteoric Irons with Comparative Descriptions of two new Examples of Magnetic Iron Oxides from Terrestrial Sources. By Earl V. Shannon.
- Alberta Scientific and Industrial Research Council: Report 18—The Bituminous Sands of Alberta. By K. A. Clark and S. M. Blair.
 Seventh Annual Report No. 20, 1926.
- Australian Museum, Records of, Vol. 15, No. 6. Vol. 16, No. 1.
 Canadian Mining and Metallurgical Bulletin No. 187. No. 188.
 Canada Department of Mines:
 Investigation of Fuels and Fuel Testing, 1925.
 Economic Geology, Series No. 4—Arsenic-Bearing Deposits in Canada. By M. E. Hurst.
 Summary Report, 1926, Part A. Part C.
- Great Britain Department of Scientific and Industrial Research:
 The Country Between Stafford and Market Drayton. By T. H. Whitehead.
 The Geology of Belford, Holy Island and the Farne Islands.
- Manitoba Industrial Development Board: The Flin Flon Orebody. By R. C. Wallace.

Manitoba University: The Mineral Resources of Manitoba. By R. C. Wallace.
Mexico Departamento del Petroleo: Bibliografia del Petroleo en Mexico.

Mexico Secretaria de Industria, Comercio y Trabajo:

La Industria del Petroleo en Mexico. Pro Jose Colomo.

Boletin del Petroleo, Vol. XXIV, Num. 1, Num. 2, Num. 3, Num. 4.

Anuario de Estadistica Minera.

Boletin Minero, Tomo XXIV, Numero 2, Numero 3, Numero 4.

Nova Scotia Institute of Science, Proceeding and Transactions of the, Vol. 17,
Part I.

Ontario Department of Mines, 36th Annual Report of the, Vol. XXXVI, Part II,
1927.

Philippine Department of Agriculture and Natural Resources: The Mineral Re-
sources of the Philippine Islands for the years 1924 and 1925.

Philippine Journal of Science, The, Vol. 34, No. 1, No. 2.

Rio de Janeiro Oficinas Graficas da Biblioteca Nacional: Ideas Geraes Sobre
a Revolucao do Brazil e Suas Consequencias. Por Francisco de Sierra y
Mariscal.

Memorias sobre o Estabelecimento do Imperio do Brazil ou novo Imperio
Lusitano.

Archivos do Museu Nacional Do Rio de Janeiro, Vol. XXVIII, Dec. 1926.

South Australia Department of Mines:

Mining Review for the Half-year Ended June 30, 1927.

Annual Report of the Director of Mines and Government Geologist for 1926.
Svegiges Geologiska Undersokning: Strassa och Blanka Jarnmalmsfalt. Ser CA,
No. 20.

Western Australia Geological Survey:

Bulletin 84—The Field Geology and Broader Mining Features of the Lenore-
Duckeyon District. By E. D. C. Clark.

86—The Geology and Mineral Resources of the Yalgoo Gold Field,
Part II. The Mining Centres of Rothesay and Goodingnow
(Paynes Find). By E. D. C. Clark.

90—The Geology of a Portion of the East Coolgardie and E. N. E.
Coolgardie Gold Fields, Including the Mining Centres of Mon-
ger and St. Ives. By E. D. C. Clark.

85—A Geological Reconnaissance of Part of the Ashburton Drainage
Basin with Notes on the Country Southwards to Meekatharra.
By W. H. B. Talbot.

Annual Progress Report of the Geological Survey of Western Australia for the
Year 1926.

University of California: A Review of the Fossil Parapavo Californicus (Miller)
from the Pleistocene Asphalt Beds of Rancho La Brea.

University of California Press: A Physical Study of the Mokelumne Pipe Line.
Imperial University of Tokio: Journal of the Faculty of Science, Vol. I, Part 10;
Vol. II, Part 3, Part 4.

On the Peculiar Ore Deposits of the Asakawa Mine in the Province of Awa,
Shikoku. By T. Kato.

Tohoku Imperial University, Sendai, Japan: The Science Reports of the Second
Series (Geology), Vol. XI, No. 1.

University of Kansas: Oil and Gas Resources of Kansas, Bulletin 6.

University of Minnesota:

Field Studies of the Sources of Mold in Butter. By H. Macy and W. B. Combs.
How Minnesota Farm Family Incomes are Spent. By Carl C. Zimmerman
and John D. Black,

Co-Operative Egg and Poultry Assembling Units in Minnesota. By H. B.
Price and G. W. Sprague.

University of Missouri, School of Mines and Metallurgy: Bulletin, Vol. 10,
No. 3—Recent Developments in Ammonia Leaching for Zinc Ores. By H. M.
Lawrence.

University of South Carolina:

Origin of the Cretaceous White Clays of South Carolina. By Fred R. Neu-
mann.

Fault Troughs. By Stephen Taber.

Current Magazines on File.

For the convenience of persons wishing to consult the technical magazines in the reading room, a list of those on file is appended:

- American Petroleum Institute, New York.
Architect and Engineer, San Francisco.
Arizona Mining Journal, Phoenix, Arizona.
Asbestos, Philadelphia, Pennsylvania.
Brick and Clay Record, Chicago.
Bulletin, Union Oil Co., Los Angeles.
California Journal of Development, San Francisco.
Cement, Mill and Quarry, Chicago, Illinois.
Chemical-Engineering and Mining Review, Melbourne, Australia.
Engineering and Mining Journal, New York.
Explosives Engineer, Wilmington, Del.
Financial Insurance News, Los Angeles, California.
Graphite, Jersey City.
Journal of Electricity and Western Industry, San Francisco.
Metallurgical and Chemical Engineering, New York.
Mine and Quarry, Chicago.
Mining and Engineering Record, Vancouver, B. C.
Mining and Oil Bulletin, Los Angeles.
Oil Age, Los Angeles.
Oil and Gas Journal, Tulsa, Oklahoma.
Oil and Gas News, Kansas City.
Oil News, Galesburg, Illinois.
Oildom, New York.
Oil, Paint and Drug Reporter, New York.
Oil Trade Journal, New York.
Oil Weekly, Houston, Texas.
Petroleum Age, New York.
Petroleum Record, Los Angeles.
Petroleum World, Los Angeles.
Queensland Government Mining Journal, Brisbane, Australia.
Rock Products, Chicago, Illinois.
Safety News, Industrial Accident Commission, San Francisco.
Salt Lake Mining Review, Salt Lake City, Utah.
Southwest Builder and Contractor, Los Angeles.
Standard Oil Bulletin, San Francisco.
Stone, New York.
The Record, Associated Oil Company, San Francisco.
Through the Ages, Baltimore.

Newspapers.

The following papers are received and kept on file in the library:

- Amador Dispatch, Jackson, Cal.
Arkansas Oil and Mineral News, Hot Springs National Park (Arkansas).
Barstow Printer, Barstow, Cal.
Blythe Herald, Blythe, Cal.
Bridgeport Chronicle-Union, Bridgeport, Mono Co., Cal
Calaveras Prospect, San Andreas, Cal.
California Oil World, Los Angeles, Cal.
Cloverdale Reveille, Cloverdale, Cal.
Colusa Daily Sun, Colusa, Cal.
Daily Commercial News, San Francisco, Cal.
Daily Midway Driller, Taft, Cal.
Del Norte Triplicate, Crescent City, Cal.
Exeter Sun, Exeter, Cal.
Gateway Gazette, Beaumont, Cal.
Goldfield News, Goldfield, Nevada.
Guerneville Times, Guerneville, Cal.
Healdsburg Enterprise, Healdsburg, Cal.
Humboldt Standard, Eureka, Cal.
Inyo Independent, Independence, Cal.

Inyo Register, Bishop, Cal.
Ione Valley Echo, Ione, Cal.
Lake County Bee, Lakeport, Cal.
Mining and Financial Record, Denver, Colo.
Mining Topics, San Francisco, Cal.
Mountain Democrat, Placerville, Cal.
Mountain Messenger, Downieville, Cal.
Nevada Mining Press, Reno, Nevada.
Oatman Mining News, Oatman, Arizona.
Oregon Observer, Grants Pass, Oregon.
Oroville Daily Register, Oroville, Cal.
Petroleum Reporter, Taft, Cal.
Placer Herald, Auburn, Cal.
Plumas Independent, Quincy, Cal.
Plumas National Bulletin, Quincy, Cal.
Randsburg Times, Randsburg, Cal.
San Diego News, San Diego, Cal.
Shasta Courier, Redding, Cal.
Siskiyou News, Yreka, Cal.
Stockton Record, Stockton, Cal.
Tuolumne Prospector, Tuolumne, Cal.
Ventura Daily Post, Ventura, Cal.
Weekly Trinity Journal, Weaverville, Cal.
Western Sentinel, Etna Mills, Cal.



PRODUCERS AND CONSUMERS.

The producer and consumer of mineral products are mutually dependent upon each other for their prosperity, and one of the most direct aids rendered by the Bureau to the mining industry in the past has been that of bringing producers and consumers into direct touch with each other.

This work has been carried on largely by correspondence, supplemented by personal consultation. Lists of buyers of all the commercial minerals produced in California have been made available to producers upon request, and likewise the owners of undeveloped deposits of various minerals, and producers of them, have been made known to those looking for raw mineral products.

When the publication of *MINING IN CALIFORNIA* was on a monthly basis, current inquiries from buyers and sellers were summarized and lists of mineral products or deposits 'wanted' or 'for sale' included in each issue.

It is important that inquiries of this nature reach the mining public as soon as possible and in order to avoid the delay incident to the present quarterly publication of *MINING IN CALIFORNIA*, these lists are now issued monthly in the form of a mimeographed sheet under the title of 'Commercial Mineral Notes,' and sent to those on the mailing list for *MINING IN CALIFORNIA*.



EMPLOYMENT SERVICE.

Following the establishment of the Mining Division branch offices in 1919, a free technical employment service was offered as a mutual aid to mine operators and technical men for the general benefit of the mineral industry.

Briefly summarized, men desiring positions are registered, the cards containing an outline of the applicant's qualifications, position wanted, salary desired, etc., and as notices of 'positions open' are received, the names and addresses of all applicants deemed qualified are sent to the prospective employer for direct negotiations.

Telephone and telegraphic communications are also given immediate attention.

Technical men, or those qualified for supervisory positions, and vacancies of like nature, only are registered, as no attempt will be made to supply common mine and mill labor.

A list of current applications for positions and 'positions open' is carried in each issue. Notices are designated by a key number, and the name and address corresponding to any number will be supplied upon request, without delay or charge of any kind. If desired, recommendations may be filed with an application, but copies only should be sent to the Division of Mines and Mining, to avoid possible loss. Registration cards for the use of both prospective employers and employees may be obtained upon request, and a cordial invitation is extended to the industry to make free use of the facilities afforded.

POSITIONS WANTED.

- 61-1 Mill man. Long experience with stamps, amalgamation, concentration, ball and tube mills and some flotation and cyanidation experience. Age 40. Married. References.
- 61-2 Engineer's helper, mill or laboratory work. One and one-half years' experience. Age 21. Single. References.
- 61-3 Geologist's or chemist's assistant. Three years' experience. Age 27. Married. References.



PUBLICATIONS OF THE DIVISION OF MINES AND MINING.

During the past forty-eight years, in carrying out the provisions of the organic act creating the former California State Mining Bureau, there have been published many reports, bulletins and maps which go to make up a library of detailed information on the mineral industry of the state, a large part of which could not be duplicated from any other source.

One feature that has added to the popularity of the publications is that many of them have been distributed without cost to the public, and even the more elaborate ones have been sold at a price which barely covers the cost of printing.

Owing to the fact that funds for the advancing of the work of this department have often been limited, many of the reports and bulletins mentioned were printed in limited editions which are now entirely exhausted.

Copies of such publications are available, however, in the office of the Division of Mines and Mining, in the Ferry Building, San Francisco; New Orpheum Building, Los Angeles; Capitol Extension Building, Sacramento; Santa Maria; Santa Paula; Coalinga; Taft; Bakersfield. They may also be found in many public, private and technical libraries in California and other states, and foreign countries.

A catalog of all publications from 1880 to 1917, giving a synopsis of their contents, is issued as Bulletin No. 77.

Publications in stock may be obtained by addressing any of the above offices and enclosing the requisite amount in the case of publications that have a list price. Only coin, stamps or money orders should be sent, and it will be appreciated if remittance is made in this manner rather than by personal check.

The prices noted include delivery charges to all parts of the United States. Money orders should be made payable to the Division of Mines and Mining.

REPORTS.

Asterisks (**) indicate the publication is out of print.

	Price
**First Annual Report of the State Mineralogist, 1880, 43 pp. Henry G. Hanks	-----
**Second Annual Report of the State Mineralogist, 1882, 514 pp., 4 illustrations, 1 map. Henry G. Hanks	-----
**Third Annual Report of the State Mineralogist, 1883, 111 pp., 21 illustrations. Henry G. Hanks	-----
**Fourth Annual Report of the State Mineralogist, 1884, 410 pp., 7 illustrations. Henry G. Hanks	-----
**Fifth Annual Report of the State Mineralogist, 1885, 234 pp., 15 illustrations, 1 geological map. Henry G. Hanks	-----
**Sixth Annual Report of the State Mineralogist, Part I, 1886, 145 pp., 3 illustrations, 1 map. Henry G. Hanks	-----
**Part II, 1887, 222 pp., 36 illustrations. William Ireland, Jr.	-----
**Seventh Annual Report of the State Mineralogist, 1887, 315 pp. William Ireland, Jr.	-----
**Eighth Annual Report of the State Mineralogist, 1888, 948 pp., 122 illustrations. William Ireland, Jr.	-----
**Ninth Annual Report of the State Mineralogist, 1889, 352 pp., 57 illustrations, 2 maps. William Ireland, Jr.	-----
**Tenth Annual Report of the State Mineralogist, 1890, 983 pp., 179 illustrations, 10 maps. William Ireland, Jr.	-----

REPORTS—Continued.

Asterisks (**) indicate the publication is out of print.

	Price
Eleventh Report (First Biennial) of the State Mineralogist, for the two years ending September 15, 1892, 612 pp., 73 illustrations, 4 maps. William Ireland, Jr.	\$1.00
**Twelfth Report (Second Biennial) of the State Mineralogist, for the two years ending September 15, 1894, 541 pp., 101 illustrations, 5 maps. J. J. Crawford	-----
**Thirteenth Report (Third Biennial) of the State Mineralogist, for the two years ending September 15, 1896, 726 pp., 93 illustrations, 1 map. J. J. Crawford	-----
Chapters of the State Mineralogist's Report, Biennial Period, 1913-1914, Fletcher Hamilton:	-----
**Mines and Mineral Resources, Amador, Calaveras and Tuolumne Counties, 172 pp., paper	-----
Mines and Mineral Resources, Colusa, Glenn, Lake, Marin, Napa, Solano, Sonoma and Yolo Counties, 208 pp., paper	.50
Mines and Mineral Resources, Del Norte, Humboldt, and Mendocino Counties, 59 pp., paper	.25
**Mines and Mineral Resources, Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin and Stanislaus Counties, 220 pages, paper	-----
Mines and Mineral Resources of Imperial and San Diego Counties, 113 pp., paper	.35
**Mines and Mineral Resources, Shasta, Siskiyou and Trinity Counties, 180 pp., paper	-----
**Fourteenth Report of the State Mineralogist, for the Biennial Period 1913-1914, Fletcher Hamilton, 1915:	-----
A General Report on the Mines and Mineral Resources of Amador, Calaveras, Tuolumne, Colusa, Glenn, Lake, Marin, Napa, Solano, Sonoma, Yolo, Del Norte, Humboldt, Mendocino, Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin, Stanislaus, San Diego, Imperial, Shasta, Siskiyou, and Trinity Counties, 974 pp., 275 illustrations, cloth	-----
Chapters of the State Mineralogist's Report, Biennial Period, 1915-1916, Fletcher Hamilton:	-----
**Mines and Mineral Resources, Alpine, Inyo and Mono Counties, 176 pp., paper	-----
**Mines and Mineral Resources, Butte, Lassen, Modoc, Sutter, and Tehama Counties, 91 pp., paper	-----
Mines and Mineral Resources, El Dorado, Placer, Sacramento, and Yuba Counties, 198 pp., paper	.65
Mines and Mineral Resources, Monterey, San Benito, San Luis Obispo, Santa Barbara, and Ventura Counties, 183 pp., paper	.65
Mines and Mineral Resources, Los Angeles, Orange, and Riverside Counties, 136 pp., paper	.50
**Mines and Mineral Resources, San Bernardino and Tulare Counties, 186 pp., paper	-----
**Fifteenth Report of the State Mineralogist, for the Biennial Period 1915-1916, Fletcher Hamilton, 1917:	-----
A General Report on the Mines and Mineral Resources of Alpine, Inyo, Mono, Butte, Lassen, Modoc, Sutter, Tehama, Placer, Sacramento, Yuba, Los Angeles, Orange, Riverside, San Benito, San Luis Obispo, Santa Barbara, Ventura, San Bernardino and Tulare Counties, 990 pp., 413 illustrations, cloth	-----
Chapters of the State Mineralogist's Report, Biennial Period 1917-1918, Fletcher Hamilton:	-----
Mines and Mineral Resources of Nevada County, 270 pp., paper	.75
Mines and Mineral Resources of Plumas County, 188 pp., paper	.50
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Eighteenth Report of the State Mineralogist, 1922, Mining in California, Fletcher Hamilton. Chapters published monthly beginning with January, 1922:	1.75

REPORTS—Continued.

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Chapters of Nineteenth Report of the State Mineralogist, 'Mining in California,' Fletcher Hamilton and Lloyd L. Root. January, February, March, September, 1923 -----	Free
Chapters of Twentieth Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly. January, April, **July, October, 1924, per copy-----	\$0.25
Chapters of Twenty-first Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly.	
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April, 1925, Mines and Mineral Resources of Calaveras, Merced, San Joaquin, Stanislaus and Ventura counties-----	.25
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Summary of Operations—California Oil Fields. Published monthly, beginning April, 1919:	
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**Bulletin No. 73. First Annual Report of the State Oil and Gas Supervisor of California, for the fiscal year 1915-16, by R. P. McLaughlin. 278 pp., 26 illustrations	-----
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Bulletin No. 86. California Mineral Production for 1918, with County Maps, by Walter W. Bradley, 1919. 212 pp., paper	Free

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PRELIMINARY REPORTS.

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**Preliminary Report No. 6. A Review of Mining in California During 1913. Fletcher Hamilton, 1920. 43 pp. Paper.	-----
**Preliminary Report No. 7. The Clay Industry in California. By E. S. Boalich, W. O. Castello, E. Huguenin, C. A. Logan, and W. B. Tucker, 1920. 102 pp. 24 illustrations. Paper.	-----
**Preliminary Report No. 8. A Review of Mining in California During 1921, with Notes on the Outlook for 1922. Fletcher Hamilton, 1922. 68 pp. Paper.	-----

MISCELLANEOUS PUBLICATIONS.

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**First Annual Catalogue of the State Museum of California, being the collection made by the State Mining Bureau during the year ending April 16, 1881. 350 pp.	-----
**Catalogue of books, maps, lithographs, photographs, etc., in the library of the State Mining Bureau at San Francisco, May 15, 1884. 19 pp.	-----
**Catalogue of the State Museum of California, Volume II, being the collection made by the State Mining Bureau from April 16, 1881, to May 5, 1884. 220 pp.	-----

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**Catalogue of the Library of the California State Mining Bureau, September 1, 1892. 149 pp.	-----
**Catalogue of West North American and Many Foreign Shells with Their Geographical Ranges, by J. G. Cooper. Printed for the State Mining Bureau, April, 1894.	-----
**Report of the Board of Trustees for the four years ending September, 1900. 15 pp. Paper.	-----
Bulletin, Reconnaissance of the Colorado Desert Mining District. By Stephen Bowers, 1901. 19 pp. 2 illustrations. Paper.	-----
Commercial Mineral Notes. A monthly mimeographed sheet, beginning April, 1923	Free
	Free

MAPS.

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**Register of Mines, with Map, Amador County	-----
**Register of Mines, with Map, Butte County	-----
**Register of Mines, with Map, Calaveras County	-----
**Register of Mines, with Map, El Dorado County	-----
**Register of Mines, with Map, Inyo County	-----
**Register of Mines, with Map, Kern County	-----
**Register of Mines, with Map, Lake County	-----
**Register of Mines, with Map, Mariposa County	-----
**Register of Mines, with Map, Nevada County	-----
**Register of Mines, with Map, Placer County	-----
**Register of Mines, with Map, Plumas County	-----
**Register of Mines, with Map, San Bernardino County	-----
**Register of Mines, with Map, San Diego County	-----
Register of Mines, with Map, Santa Barbara County (1906)	\$0.25
**Register of Mines, with Map, Shasta County	-----
**Register of Mines, with Map, Sierra County	-----
**Register of Mines, with Map, Siskiyou County	-----
**Register of Mines, with Map, Trinity County	-----
**Register of Mines, with Map, Tuolumne County	-----
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Register of Oil Wells, with Map, Los Angeles City (1906)	.35

OTHER MAPS.

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**Map of California, Showing Mineral Deposits (50 x 60 in.)	-----
**Map of Forest Reserves in California	-----
**Mineral and Relief Map of California	-----
**Map of El Dorado County, Showing Boundaries, National Forests	-----
**Map of Madera County, Showing Boundaries, National Forests	-----
**Map of Placer County, Showing Boundaries, National Forests	-----
**Map of Shasta County, Showing Boundaries, National Forests	-----
**Map of Sierra County, Showing Boundaries, National Forests	-----
**Map of Siskiyou County, Showing Boundaries, National Forests	-----
**Map of Tuolumne County, Showing Boundaries, National Forests	-----
**Map of Mother Lode Region	-----
**Map of Desert Region of Southern California	-----
Map of Minaret District, Madera County	.20
Map of Copper Deposits in California	.05
**Map of Calaveras County	-----
**Map of Plumas County	-----
**Map of Trinity County	-----

OTHER MAPS—Continued.

	Price
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Geological Map of Inyo County. Scale 1 inch equals 4 miles-----	----
Map of California accompanying Bulletin No. 89, showing generalized classification of land with regard to oil possibilities. Map only, without Bulletin-----	.25
**Geological Map of California, 1916. Scale 1 inch equals 12 miles. As accurate and up-to-date as available data will permit as regards topography and geography. Shows railroads, highways, post offices and other towns. First geological map that has been available since 1892, and shows geology of entire state as no other map does. Geological details lithographed in 28 colors. Mounted-----	----
Topographic Map of Sierra Nevada Gold Belt, showing distribution of auriferous gravels, accompanying Bulletin No. 92 (also sold singly) In 4 colors -----	.50

OIL FIELD MAPS.

These maps are revised from time to time as development work advances and ownerships change.

Map No. 1—Sargent, Santa Clara County-----	.50
Map No. 2—Santa Maria, including Cat Canyon and Los Alamos-----	.75
Map No. 3—Santa Maria, including Casmalia and Lompoc-----	.75
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Map No. 5—Whittier-Fullerton, including Whittier, West Coyote, and Montebello-----	.75
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Map No. 22—Portion of District 3, Showing Oil Fields, Santa Barbara County-----	.75
Map No. 23—Portion of District 2, Showing Boundaries of Oil Fields, Ventura County-----	.75
Map No. 24—Portion of District 1, Showing Boundaries of Oil Fields, Los Angeles and Orange counties-----	.75
Map No. 26—Huntington Beach Oil Field-----	.75
Map No. 27—Santa Fe Springs Oil Field-----	.75
Map No. 28—Torrance, Los Angeles County-----	.75
Map No. 29—Dominguez, Los Angeles County-----	.75
Map No. 30—Rosecrans, Los Angeles County-----	.75
Map No. 31—Inglewood, Los Angeles County-----	.75
Map No. 32—Seal Beach, Los Angeles and Orange Counties-----	.75

DETERMINATION OF MINERAL SAMPLES.

Samples (limited to three at one time) of any mineral found in the state may be sent to the Division of Mines and Mining for identification, and the same will be classified free of charge. No samples will be determined if received from points outside the state. It must be understood that no assays, or quantitative determinations will be made. Samples should be in lump form if possible, and marked plainly with name of sender on outside of package, etc. No samples will be received unless delivery charges are prepaid. A letter should accompany sample, giving locality where mineral was found and the nature of the information desired.

STATE OF CALIFORNIA
DIVISION OF MINES AND MINING

CORDIALLY INVITES YOU TO VISIT
ITS VARIOUS DEPARTMENTS MAINTAINED
FOR THE PURPOSE OF FURTHERING
THE DEVELOPMENT OF THE

MINERAL RESOURCES OF CALI-
FORNIA

At the service of the public are the scientific reference library and reading room, the general information bureau, the laboratory for the free determination of mineral samples found in the state, and the largest museum of mineral specimens on the Pacific Coast. The time and attention of the State Mineralogist, as well as that of his technical staff, are also at your disposal.

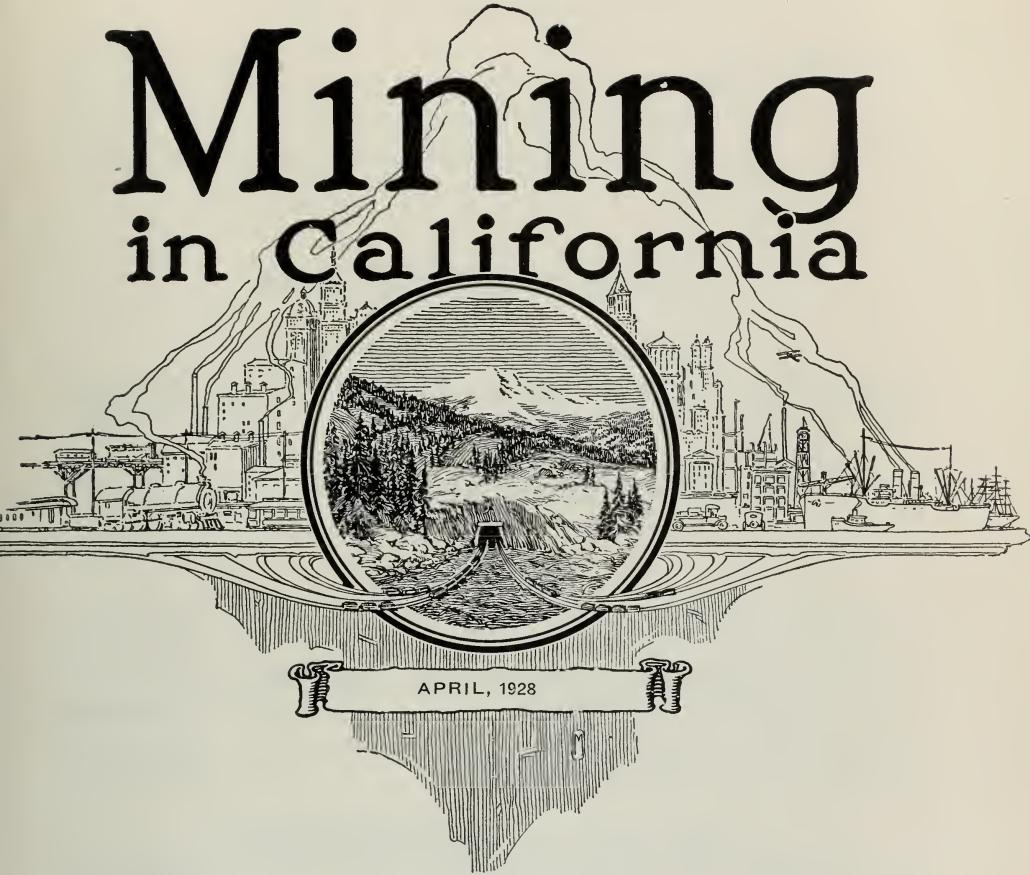
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Mining in California



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NOTE.—A detailed report of the activities of the Department of Petroleum and Gas is issued monthly by the Division of Mines and Mining, entitled 'Summary of Operations, California Oil Fields.'

STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINES AND MINING
FERRY BUILDING, SAN FRANCISCO

LLOYD L. ROOT

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MINING IN CALIFORNIA

AND THE

ACTIVITIES OF THE DIVISION OF MINES
AND MINING



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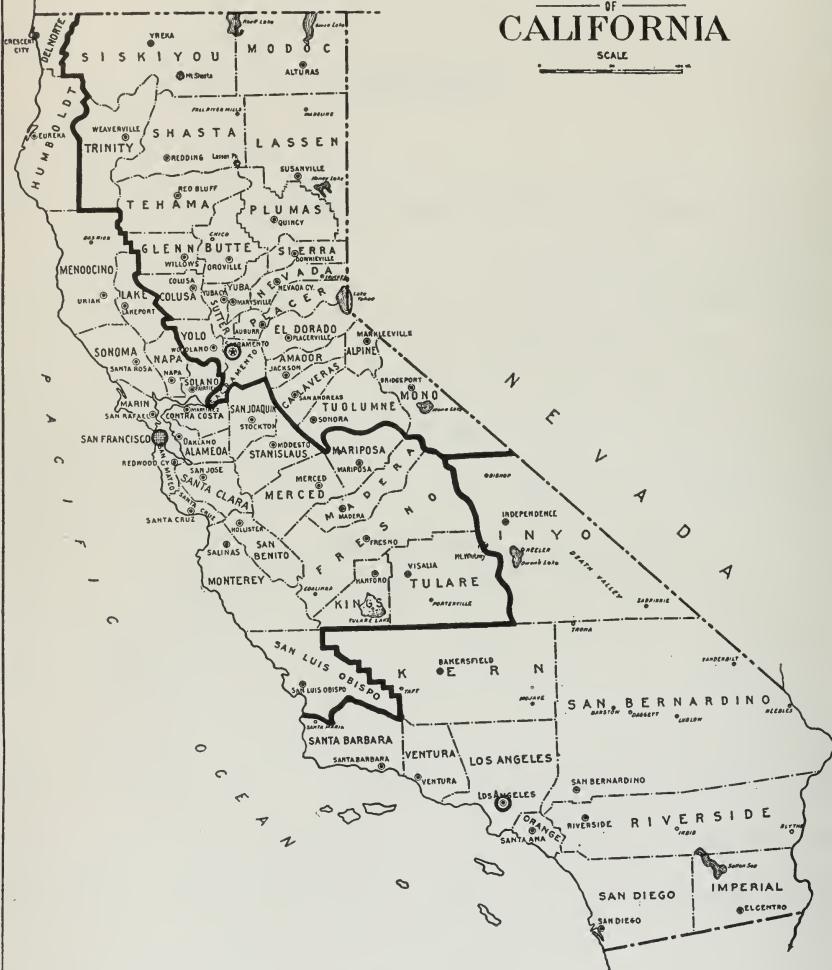
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State of California
DIVISION OF MINES AND MINING

LLOYD L. ROOT
STATE MINERALOGIST

OUTLINE MAP
OF
CALIFORNIA

SCALE



- LEGEND -

- Mining Division Boundaries
○ Mining Division Offices.

PREFACE

The Division of Mines and Mining (formerly State Mining Bureau) is maintained for the purpose of assisting in all possible ways in the development of California's mineral resources.

As one means of offering tangible service to the mining public, the State Mineralogist for many years has issued an annual or a biennial report reviewing in detail the mines and mineral deposits of the various counties.

The weak point in work of this character has been that the results of field investigations were so long in preparation that they had lost much of their usefulness by the time they finally appeared in print.

As a progressive step in advancing the interests of the mineral industry, publication of the Annual Report of the State Mineralogist in the form of monthly chapters was begun in January, 1922, and continued until March, 1923.

Owing to a lack of funds for printing this was changed to quarterly publication, beginning in September, 1923.

For the same reason, beginning with the January, 1924, issue, it has been necessary to charge a subscription price of \$1 per calendar year, payable in advance; single copies, 25 cents apiece. 'Mining in California' will continue to be sent without charge to our exchange list, including schools and public libraries, as are also other publications of the Division of Mines and Mining.

Pages are numbered consecutively throughout the year and an index to the complete reports is included annually in the closing number.

Such a publication admits of several improvements over the old method of procedure. Each issue contains a report of the current development and mining activities of the state, prepared by the district mining engineers. Special articles dealing with various phases of mining and allied subjects by members of the staff and other contributors are included. Mineral production reports formerly issued only as an annual statistical bulletin are published herein as soon as returns from producers are compiled. The executive activities, and those of the laboratory, museum, library, employment service and other features with which the public has had too little acquaintance also are reported.

While current activities of all descriptions will be covered in these chapters, the practice of issuing from time to time technical reports on special subjects will be continued, as well. A list of such reports now available is appended hereto, and the names of new bulletins will be added in the future as they are completed.

The chapters will be subject to revision, correction and improvement. Constructive suggestions from the mining public will be gladly received, and are invited.

The one aim of the Division of Mines and Mining is to increase its usefulness and to stimulate the intelligent development of the wonderful, latent resources of the State of California.

DISTRICT REPORTS OF MINING ENGINEERS

In 1919-1920 the Mining Department was organized into four main geographical divisions, with the field work delegated to a mining engineer in each district, working out from field offices that were established in Redding, Auburn, San Francisco and Los Angeles, respectively. This move brought the office into closer personal contact with operators, and it has many advantages over former methods of conducting field work. In 1923 the Redding and Auburn field offices were consolidated and moved to Sacramento.

The boundaries of each district were adjusted and the counties now included in each of the three divisions, and the locations of the branch offices, are shown on the accompanying outline map of the state. (Frontispiece.)

Reports of mining activities and development in each division, prepared by the district engineer, will continue to appear under the proper field division heading.

Although the petroleum industry is but little affiliated with other branches of mining, oil and gas are among the most valuable mineral products of California, and a report by the State Oil and Gas Supervisor on the current development and general conditions in the state's oil fields is included under this heading.

New County Reports.

The series of separate reports on the mines and mineral resources of the different counties, that together comprise the State Mineralogist's Reports XIV to XVII, inclusive, in the case of many of the counties have become exhausted. Those still in stock are in need of revision. It was deemed advisable, therefore, beginning with the January, 1925, issue of 'Mining in California,' to make the district engineers' reports in the form of a complete general report on the mines and mineral resources in one or more of the counties in each district.

This program will be followed as near as possible in succeeding numbers of the quarterly until each county in the state has been covered.

SACRAMENTO FIELD DIVISION

C. A. LOGAN, Mining Engineer.

On account of unfinished field work there is no report from the Sacramento Field Division in this issue.

LOS ANGELES FIELD DIVISION

W. BURLING TUCKER, Mining Engineer.

On account of unfinished field work there is no report from the Los Angeles Field Division in this issue.

SAN FRANCISCO FIELD DIVISION

C. McK. LAIZURE, Mining Engineer.

MARIPOSA COUNTY**Introduction.**

This county, whose euphonious name of Spanish derivation indicates its early origin, was one of the twenty-seven counties into which the state was divided at the first session of the legislature in 1850. It shared with San Diego the distinction of being the largest of those counties.

As originally created, it contained the whole of that portion of the state which is now included in the boundaries of Mariposa, Merced, Madera, Fresno, Kings, Tulare, and Kern counties and, in addition, included a large portion of Mono and Inyo and small parts of San Bernardino, Los Angeles, and San Benito counties.¹ Subsequent changes and the creation of other counties have almost without exception tended to diminish its area.

Geography.

Mariposa County is situated in the east-central portion of the state. It is roughly triangular in shape. Its boundary on the southwest, which separates it from Merced County, runs for 35 miles along the eastern border of San Joaquin Valley. The north boundary is an irregular line following the divide between Merced and Tuolumne rivers, trending nearly due east from the edge of the valley to the summit of the Sierra Nevada. Tuolumne County adjoins on the north. From the eastern apex the line separating Mariposa from Madera County runs southwesterly a distance of 65 miles to the edge of the great valley.

As now delineated, Mariposa County has an area of 1463 square miles. Its population is 2775 (1920 census). In 1910 it was 3956, and in 1900 it was 4720, showing a loss of 2000 residents in two decades. Similar losses have been shared by other Mother Lode mining counties during the same period.

Mariposa is the most southerly of the group of five counties through which courses the world-renowned 'Mother Lode' of California; a nearly continuous mineralized vein system that has been actively exploited for more than 75 years, and the locus of a majority of the most productive gold quartz mines in the state.

Mining has always been the chief industry in Mariposa County. At least 80% of its area is mountainous and non-tillable, but a little general farming and stock-raising is carried on in the foothills and there are logging operations near El Portal.

The eastern third of the county is within Yosemite National Park; some of the most noted points of interest in the park, including Yosemite Valley and Mariposa Group of Big Trees, being in this county.

The only railroad in the county is Yosemite Valley Railroad, which connects Merced with El Portal. Much of this line is within the deep canyon of Merced River which it traverses, but it never-the-less provides much-needed shipping points in the central portion of the county.

¹ Coy, Owen C., California County Boundaries, California Historical Survey Commission, Berkeley, 1923.

Yosemite All-Year Highway, which was opened to traffic in 1926, is the only modern improved automobile road. Other county roads leading to the various outlying mining districts, are passable most of the year, but they are little improved and for the most part are narrow, crooked and rough. A large number of mining properties are accessible only by trail.



View taken on road between Mariposa and Coulterville, looking northwesterly along course of Mother Lode, from a point three miles north of Bear Valley, and showing road winding down to bridge over Merced River at Bagby (near center of photo). Drop in elevation approximately 1200 feet.

Electric power lines of the San Joaquin Light and Power Company and the Pacific Gas and Electric Company supply light and power to the principal towns, Hornitos, Coulterville, Bagby and Mariposa. Most of the larger mines on the 'Grant' are also connected up and these lines are gradually being extended to the more remote properties as a demand for service arises.

Topography.

The topography varies from the valley floor in the extreme southwest corner through the rolling foothills in the central portion to the high Sierra at the eastern apex where the elevation ranges around 10,000 feet and over.

The greater part of the county is extremely rugged, being cut by winding streams into many deep canyons with high ridges. Merced River and its branches drain most of the county. Bear Creek, Mariposa Creek and Chowchilla River drain the southwestern portion. The topography is shown in detail on the topographic sheets of the U. S. Geological Survey covering this area.

Geology.

A detailed geological map and descriptive text of the geology of the county and the Mother Lode gold belt from a point near the town of Mt. Bullion north and west beyond the county limits is contained in U. S. Geological Survey Geologic Folio No. 41 (Sonora Quadrangle).

The report of Fairbanks¹ covering a geological reconnaissance in the county is contained in Report X of the State Mineralogist. Further geological notes by Storms² are contained in Report XII. Considerable study has been given to the geology of Yosemite Valley and there are fragmentary notes in print covering other small areas, but no single geological report or map, covering the county as a whole, is available. The main features will be outlined briefly here.

The eastern half of the county, the high Sierra and Yosemite Valley region, is composed of granitic rocks. Being within the Park reserve, there is no mining here, although there is reported to be some little-explored mineralized areas containing base ores in the high Sierra. The border of this granite mass curves around to the southwest and with the exception of a long narrow tongue of Jurassic slate, which extends down into Madera County, granite is the predominating formation along the southeastern boundary almost to the valley floor.

In contact with the granite on the west is a broad belt of Calaveras slate (Carboniferous) over ten miles in width trending in a general northwest direction. This belt of slate and schistose rocks contains lenses of limestone and quartzite and is intruded by many porphyritic dikes of igneous rocks. It also contains the many scattered gold quartz veins of the so-called 'east belt.'

West of the Calaveras slate belt, their contact running irregularly northwestward through Mariposa, Bagby and Coulterville, is another belt 10 to 15 miles wide of later Jurassic rocks. This formation includes the Mariposa slate of the Mother Lode and parallel bands of amphibolite schist, porphyrite, serpentine, small limestone lenses and many intruding dikes of igneous rock. Besides the Mother Lode, which in this county is characterized by the great width and prominent outcrop of the quartz veins, there are numerous other gold- and copper-bearing ledges in the western portion of this belt in Hunter Valley, near Hornitos and south toward Raymond, Madera County.

MINERAL RESOURCES

Occurrences of practically all of the metals produced commercially in California have been found in Mariposa County, but gold, silver, and copper ores comprise its chief metal resources. A small output of lead, platinum and chromite is of record and deposits of minor importance or of scientific interest only, containing cinnabar, manganese, arsenopyrite, zinc, cobalt, iron, antimony and other metals have been reported.

Its nonmetallic resources, including structural and industrial minerals, only recently have begun to be utilized to an appreciable extent. Barytes, marble, limestone, jasper, slate and miscellaneous stone have been or are at present being produced. Undeveloped deposits of asbestos, granite, magnesite, feldspar, mica-schist, soapstone, silica and talc also occur, some of which will undoubtedly prove of future value.

¹ Fairbanks, Harold W., Geology of the Mother Lode Region, State Mineralogist's Report X, 1890, pp. 23-90.

² Storms, H. W., Geology of a portion of Madera and Mariposa counties, State Mineralogist's Report XII, 1894, pp. 165-166.

MARIPOSA COUNTY, 1880-1926

Year	Gold, value	Silver, value	Copper		Miscellaneous and unapportioned		
			Pounds	Value	Amount	Value	Substance
1880	\$150,017	\$1,300					
1881	200,000	1,200					
1882	250,000	4,000					
1883	220,000	3,000					
1884	180,000						
1885	149,177	100					
1886	197,600						
1887	187,165	96					
1888	175,000	250					
1889	145,819	210					
1890	124,265	22					
1891	84,414						
1892	81,011	67					
1893	164,116	307					
1894	153,708	39					
1895	216,622	7					
1896	335,637	180					
1897	451,427	660					
1898	336,418	993					
1899	562,829	2,207			110 sq r's	\$600	Slate.
1900	157,663	13,853					
1901	504,928	4,787	191,622	\$30,180	70,000 lbs.	3,080	Lead.
1902	631,478	3,880	104,700	11,940			
1903	542,355	3,353	61,627	6,808			
1904	429,771	2,839	11,500	1,466			
1905	386,380	5,231	12,541	1,956		25	Platinum.
1906	366,394	3,377					
1907	405,498	4,500			1,142 lbs.	60	Lead.
1908	439,862	4,732	29,124	2,958		36,560	Miscellaneous stone.
1909	396,465	2,729				62,430	Miscellaneous stone.
1910	317,580	2,364				8,431	Unapportioned, 1900-1909.
1911	172,532	1,390	14,641	1,830	{ 800 tons	4,800	Miscellaneous stone.
1912	160,541	6,796	284,587	46,957			Barytes.
1913	171,034	7,430	416,031	64,485			Marble.
1914	131,458	677	277,472	36,904	{ 2,000 tons	3,130	Other minerals.
1915	385,577	2,175	38,630	6,760	{ 100 cu. ft.	15,366	Miscellaneous stone.
1916	401,718	2,680	162,318	39,930	{ 1,857 lbs.	3,000	Barytes.
1917	313,296	3,221	53,381	14,583	{ 1,075 lbs.	100	Marble.
1918	337,682	5,083	30,294	7,483	{ -	17,214	Miscellaneous stone.
1919	253,392	4,139	24,879	4,627	{ -	600	Other minerals.
1920	261,830	4,705	1		{ -	128	Lead.
1921	331,295	5,251			{ -	4,143	Other minerals.
1922	218,571	3,301			{ -	39,372	Miscellaneous stone.
1923	141,883	1,735			{ -	92	Lead.
1924	182,099	1,608			{ -	13,399	Other minerals.
1925	192,810	1,758			{ -	7,646	Miscellaneous stone.
1926	182,313	1,518			{ -	1,856	Chromite and lead.
Totals	\$12,781,630	\$119,750	\$1,713,347	\$278,867	{ -	400	Miscellaneous stone.
					{ -	8	Other minerals.
					{ -	400	Miscellaneous stone.
					{ -	4,096	Barytes, copper, lead.
					{ -	400	Miscellaneous stone.
					{ -	5,655	Barytes and pyrites.
					{ -	400	Miscellaneous stone.
					{ -	4,960	Barytes, pyrites and
					{ -	27,293	miscellaneous stone.
					{ -	3,000	Barytes, pyrites and
					{ -	48,000	misceellaneous stone.
					{ -	3,500	Other minerals.
					{ -	436,794	Miscellaneous stone.
					{ -	130,804	Miscellaneous stone.
					{ -	5,089	Barytes, copper and
					{ -		pyrites.

*See under 'Unapportioned.'

No record is extant showing the total mineral output of the county. The Hite vein has produced \$2,500,000; several of the 'Grant' mines from \$2,000,000 to \$4,000,000. Add to this the output of the quartz mines in the Coulterville district, that of the mines near Hornitos and in other scattered districts, and the large output of gold from early-day placer operations and the total value must have run high into the millions of dollars prior to 1880.

The table herewith gives the recorded output from 1880, when the compilation of statistics was begun by the State Mining Bureau, to 1926, inclusive. The total for this latter period is \$14,094,579. In 1926 Mariposa ranked fortieth among the 58 counties of the state with a mineral output valued at \$319,724.

In so far as gold mining is concerned, the conditions in Mariposa County have been peculiar, more than 44,000 acres, covering 15 miles of the 'Mother Lode,' having been held since the first discovery of gold as a single estate known as the Fremont, or Mariposa Grant. It is generally conceded that this situation has thrown obstacles in the way of development and exploitation, for it remains a fact that the 'southern' mines have not been developed to a depth at all comparable with those similarly situated farther north where they have proved prolific at great depths.

The great majority of the quartz mines in the county are only a few hundred feet in depth. The 'boom' days occurred prior to the introduction of the cyanide process for treating low-grade ores, before the adoption of flotation as a means of concentration and long in advance of Diesel and electric power, deep mine pumps, modern air drills and explosives, and other efficient mining equipment. The mines were using wood for fuel, steam for power and crude, often experimental, metallurgical processes. Under such conditions only the richest orebodies could be profitably worked and when these were exhausted operations on a large scale ceased.

Immense reserves of medium and low-grade ores certainly exist and properly financed and well-managed companies should find opportunities here for profitable mining equal to any in the state. The acquisition of a number of properties by new owners, new development work started and the reopening of several idle mines in 1927 indicates that this fact is being recognized and it should result in Mariposa County's mining industry assuming a much more active role.

The writer spent three weeks in the county in October, 1927, gathering data on the mining industry, in order to bring past reports up to date in conformity with the new series of county reports begun in 1925. Owing to long periods of idleness, absentee owners, intermittent working, abandonments, relocations, regroupings, and renaming of mines, it is extremely difficult to give a connected account of operations at many properties. As many as possible were visited and information regarding others obtained from sources regarded as reliable. There are, no doubt, unavoidable omissions, as it would require several months to make a complete check of the county's resources. A list of patented and unpatented claims, showing their nominal ownership (to whom assessed for tax purposes) from the county records, is included so that interested parties can at least get in touch with the owners.

A bibliography follows at the end of the text matter.

Acknowledgments.

Appreciation is here expressed for the courteous treatment and cooperation extended by the mine owners and operators and especially to the various county officials and members of the Mariposa Chamber of Commerce, who offered their assistance freely, and to others with whom the writer came in contact during this survey.

METALS**CHROMITE**

Purcell-Griffin Mine. During the world war emergency, shipments of chromite were begun in May, 1918, by Thos. Purcell and Geo. Griffin from a deposit southeast of Coulterville near Pleasant Valley station on Yosemite Valley railroad. This was the first recorded output of chromite from the county and it has been the only producing property to date, although other deposits may be reasonably expected in the serpentine areas.

COPPER

Copper mining began in Mariposa County about 1860, and was carried on with great activity for a decade or more. Some production was also noted between 1900 and 1915. Since then there has been very little activity and most of the old properties, so far as mining is concerned, are deserted, their equipment is gone, the buildings are in ruins and the workings are caved.

The so-called foothill copper belt extends for about 35 miles through the western part of the county from the old Berette and La Victoria mines in Hunter Valley to the Green Mountain Mine, seven miles north of Raymond, Madera County. The surface ores along this belt were high grade, carrying from 20% to 35% copper, besides considerable gold in many instances. Thousands of tons were mined and shipped out, and a crude smelter, believed to have been the first smelter in California, was built a few miles north of the Green Mountain mine and some copper bars produced there.

The deposits have not been explored below a few hundred feet depth, apparently the working of the ores in the leaner zone proving too large an undertaking for small capital, and the district has been so long neglected that it is now a difficult matter to interest large capital.

Among the more important properties are:

Name	Location	Sec.	T.	R.	Owner
Cavagnero Claim-----		9	4	16	F. A. Cavagnero, Hornitos.
Cavan-San Jose Copper Group -----	4, 5	8	18	S. L. Thrift, care Xclusive Laundry, California and Stockton Sts., Stockton.	
Great Northern -----	2, 3, 10, 11	7	17	C. B. Deatsch, Lewis post office.	
Green Mountain Mine-----	3	8	18	A. B. Smith, 625 Call Bldg., San Francisco.	
La Victoria Mine-----	4, 9, 10	4	16	Susan A. Lang, 2637 Shattuck Ave., Berkeley.	
Lone Tree Mine -----	{ 4 / 33	8 7	18 {	J. W. Westfall, Raymond post office.	
Pocahontas Mine -----	1, 12	7	17	Pocahontas Copper Mining Co., care W. F. Peacock, 58 Sutter St., San Francisco; Newton Webber, Lewis post office.	
White Rock Mine -----	14	7	17	Care J. H. Helm, Lewis post office.	

These and other prospects along the copper belt are described in detail in State Mining Bureau Bulletin No. 50, Copper Resources of California, 1908, and this descriptive matter will not be repeated here.

Green Mountain Mine comprises 200 acres covering the top and sides of an unwooded hill in Sec. 3, T. 8 S., R. 18 E., about eight miles north of Raymond. About half the holdings are patented agricultural land and mining claims, and half unpatented mining claims. The property is owned by *California Copper Producers Trust* with headquarters in Boston, Massachusetts. The *Floraferro Company* (not incorporated), A. B. Smith, manager, 625 Call Building, San Francisco, has been operating the mine since 1923.

Country rock is schist which is cut by dikes of diorite and granite. The veins are in the nature of replacements in the schist; are without definite strike and vary greatly in width, in places being 60 feet wide. They dip about 75° . The Green Mountain Mine has been worked extensively at different times since 1863 and has produced large quantities of high-grade oxide and carbonate ores; there being over 4000 feet of underground workings, mainly adits, and many stopes. The sulphide ores are remarkable for being very easily oxidized to copper and iron sulphates on account of their chemical composition. If piled or confined, the ore will heat and this has sometimes resulted in spontaneous ignition, on one occasion a carload of ore in transit to a smelter setting the car afire. As a result, the railroad refused to accept further shipments.

In 1919 the *United Chemicals Company* of San Francisco constructed a leaching and precipitating plant at Raymond. The ore was leached with water in a wooden tank, the solution then run to electrolytic cells and the copper precipitated on scrap iron. The copper was then treated with sulphuric acid and copper sulphate produced. The average ore treated at the plant contained 6% copper.

The *Floraferro Company* took over the property in 1923 since which time they have marketed the oxidized material as a soil corrective and for the control of snails, slugs and insects, under the trade name Floraferro. The ore is prepared by exposing it to the air which causes it to disintegrate into a fine blue-gray powder which is put up in containers without further treatment. Experiments have been carried on recently looking to the development of a market for the unoxidized material as a weed eradicator around power line and telephone line poles and along railroad rights of way. If it proves successful for this use, a greatly enlarged market would result, but it would probably require shipment in metal containers. At present from two to four men are employed.

An analysis of the ore by Smith Emery and Company showed the following composition:

	Per cent
Silica (SiO_2)	7.95
Copper (Cu)	2.04
Antimony, arsenic, etc. (Sb) (As)	Trace
Aluminum (Al_2O_3)	3.30
Ferrous oxide (FeO)	12.86
Ferric oxide (Fe_2O_3)	12.02
Manganese oxide (Mn_3O_4)	Trace
Zinc oxide (ZnO)	Nil
Lime (CaO)	Trace
Magnesia (MgO)	Trace
Soda (NaO)	0.72
Potash (K_2O)	Trace
Sulphuric anhydride (SO_3)	28.12
Sulphur free of sulphides (S)	8.25
Phosphoric acid (P_2O_5)	0.30
Chlorine (Cl)	Nil
Nitrogen in ammonia	Nil
Nitrogen in nitrates	Nil
Moisture and water of crystallization	21.44

A water solution of the sample contained by approximation:

	Per cent
Copper sulphate -----	5.16
Ferrous sulphate -----	27.34
Ferric sulphate -----	20.56
Aluminum sulphate -----	5.91
Sodium sulphate -----	1.63
Free sulphuric acid -----	Small amount

La Victoria Mine. This property was last worked in 1919-1920. W. C. Kroh and C. A. Felts had a working bond and in October, 1919, had 50 tons of ore out and ready to ship to a smelter at Tacoma, Washington. Trucking charge from the mine to Merced Falls was \$6 a ton; freight from Merced Falls to Tacoma, \$10; and smelting charges, \$3.50; a total of \$19.50 a ton, so that only high-grade ore could be handled at a profit. Work ceased in 1920 and the mine has been idle since.

GOLD (LODE MINES)

Alarid Prospect. This was a lease on the 'Mariposa Grant' last operated in 1917-18. The prospect was located $2\frac{1}{2}$ miles northwest of Mariposa, presumably on the Mariposa vein. The vein was $2\frac{1}{2}$ feet wide, the strike westerly and dip 60° S. Several hundred dollars worth of ore, which was free-milling and averaged \$15 a ton in value, was taken from a shaft 20 feet deep and a drift 100 feet long. Idle for past ten years.

Alice Mine is one of the 'Mariposa Grant' mines, located in Sec. 16, T. 5 S., R. 17 E., about four miles west of Mt. Bullion and close to the Long Mary Mine. There are two claims, which were located in the 50's. The vein is in slate and averages 3 feet in width. The strike is northwest and dip almost vertical. It is developed by a shaft 200 feet deep and 360 feet of drifts on three levels, most of which was done by leasers. The ore averaged \$12 a ton. There is no equipment, as it has been idle for more than 20 years.

Artru Mine consists of the Dorothy fractional claim, 450 feet in length located in Sec. 27, T. 4 S., R. 18 E.; owned by Belle McCord Roberts, Long Beach, California. It is in the Colorado district, about seven miles by road north of Mariposa. Elevation, 2700 feet. There is a little timber, but practically no water in summer.

The orebody consists of a soft porphyry dike 20 to 30 feet in width, coursing a little north of west throughout the length of the claim. The walls are slate. The porphyry is seamed with many narrow stringers of quartz carrying free gold; beautiful crystallized specimens often occurring in pockets. Former operations by pick and shovel methods and sluice boxes have resulted in leaving a deep trench the size of the orebody. Other workings consisted of a 75-foot shaft; 450 feet of drifts; four crosscut tunnels, each about 140 feet long, and several raises. The mine has not been worked for about 15 years. The present owner recently purchased the claim from H. Artu, who worked it for many years by crude methods. There is now electric power within three miles.

Austin Group Mine comprises seven claims located in the Whitlock district in Secs. 29, 30 and 32, T. 4 S., R. 18 E., about six miles

northwest of Mariposa; owned by *Mutual Mining Company*, 1723 Webster street, Oakland; last operated in 1912 by the Austin Group Mining and Milling Company. Elevation at the mine, 3300 feet. There is considerable timber and plenty of water in winter for operations. The vein is from 6 inches to 4 feet in width between porphyry walls and carries free gold and sulphides. Development consists of two incline shafts each 120 feet deep, a 700-foot crosscut, 150 feet of drifts and stopes to the surface.

Badger Mine (Prescott). One claim covering an old discovery made in the 50's, from which \$80,000 is said to have been taken from surface workings. The claim is situated about five miles northeast of Hornitos in Sec. 2, T. 5 S., R. 16 E. There is a quartz vein, $1\frac{1}{2}$ to 4 feet in width, which is presumed to be the same vein as that in the Mt. Gains mine. Owner, F. A. Cavagnaro, Hornitos. Idle, except for assessment work.

Berette Mine consists of two patented claims, the New Year and the Wild Cat, and 360 acres of agricultural land in Secs. 29, 30, and 32, T. 3 S., R. 16 E., in Hunter Valley, about 15 miles north of Hornitos; owners, Angele Beaudry and Jos. F. Bouvier, 4 Laguna street, San Francisco. The claims were first located about 1868. They are on the so-called 'Blue Lead,' which extends through Hunter Valley in a northwesterly direction for five or six miles; elevation, 1400 feet. A branch of Temperance Creek flows through the property, but water is not plentiful. The vein averages four feet in width, strikes northwest and dips 80° NE. The hanging wall is chert and footwall porphyry. Development consists of a number of old shafts and open cuts from a few feet to 80 feet deep and a short tunnel. No equipment. Idle.

Benton Mill was formerly located on the south bank of Merced River at Bagby, a station on the Yosemite Valley Railroad, at the point where the Mother Lode cuts across the river. The main road following the trend of the Lode between Mariposa and Coulterville also crosses the river here. Before the advent of the railroad, the settlement was known as Benton Mills. There was at one time three quartz mills here and in 1901 the hydro-electric power plant of the Mariposa Commercial and Mining Company, owners of the Mariposa Grant, was built at this place.

In 1920 a single 5-stamp mill known as the Benton mill remained, and the power plant supplying light and power on the 'Grant' was in operation but both have since been destroyed by fire. The Benton mill burned during the winter of 1921; the same fire destroying the highway bridge over the river. The latter was immediately replaced by a new structure.

San Joaquin Light and Power Company now supplies the mines and towns on the 'Grant' with electricity.

Blue Bell Mine (Jumbo) consists of two claims in Sec. 9 T. 4 S., R. 20 E., in rugged country, about four miles by trail east of Jerseydale: elevation, 2400 feet; owner, Hiram W. Bronson, Mariposa. There is a quartz vein, averaging 5 feet in width, which lies between a porphyry footwall and hanging wall of both slate and granite. Its

strike is northwest and dip 72° NE. It is opened up by a 145-ft. crosscut tunnel and drifts on the vein. No equipment except hand tools and blacksmith shop. Idle.

Bobbie Mining Company was organized in 1922 to take over the interests of an association of owners in 120 acres of land in the Moore Hill district, about three miles east of Cathay, known as the *Rich Mine*. There are three parallel veins on the property with diorite walls. The principal vein was reported to contain an ore shoot about 9 feet wide and 200 feet long having an average value of \$12 per ton. The ore is a heavy sulphide. The Bobbie Mining Company drove a 1200-ft. tunnel which gave no great depth on the vein and spent the balance of their funds in erecting a mill to treat the ore by a new process worked out by A. E. Vandercrook, of Sacramento. In 1923 shortly after completion of the mill operations ceased. The mill has since been removed. Idle.

Bogan and Baitelle Mine (B. B. Mine). This is a patented fractional claim having an area of six acres, located in Sec. 26, T. 4 S., R. 18 E., in the Colorado district, seven miles by road north of Mariposa; owner, R. B. Harper, 8 Porter Building, San Jose. It was a 'pocket' mine, located in 1849 and held by the original locator for over 70 years. Elevation at the property, 2950 feet; topography, rough. There are two veins, one contact vein, 2½ feet wide, between a porphyry footwall and slate hanging wall, and one gash vein. The mine has been developed by four adit levels from 60 to 300 feet long with several raises and stopes. Specimen rock was mined and worked in a mortar operated by a spring pole. There is no equipment. Idle.

Bondurant Mine. This is one of the principal mines in the Coulterville district and one which has been active at intervals during the past decade. The property is about 12 miles northeast of Coulterville on the North Fork of Merced River, and consists of nearly 1000 acres of mineral land located in Secs. 24, 25 and 36, T. 2 S., R. 17 E.; elevation, 3000 feet; topography, fairly steep and rolling. There are 100 acres of patented mineral land, 740 acres of patented timber land, two tunnel locations and one mill site: reported owned by A. L. Adams, 302 Center street, Bridgeport, Connecticut. Taxes on the Bondurant patented claim were assessed to Eva L. Fenn et al., 24 La Salle avenue, Trenton, New Jersey, in 1926-27.

The original claims were located in 1855 and the rich ore milled in an arrastra for several years. In 1870 an 8-stamp mill was built, and in 1887 a new 10-stamp mill was constructed. This ran about five years, then the mine was closed down and remained closed for 23 years. In 1914 five men were working, doing development work, but this work continued for only a year or two. Lack of water, long distance to tram the ore and very hard rock were among the difficulties encountered. In 1926 Walter and Arthur Ritz of Modesto, California, secured an option on the property. They put on equipment, including machine drills, and since July, 1927, have continued development with from two to eight men employed, operating under the name *Bondurant Mining Trust*, address Box 1648, Modesto. Most of this work has been confined to extending the 945-foot crosscut tunnel at the river level.

There are several quartz ledges from 4 to 15 feet in width, all with slate walls. Their general strike is northwest and dip about 35° NE., but steepening to 55° or 60° at 380 feet depth. The three principal veins are known as the Bondurant, Reynolds and Louisiana. The ore is a hard white quartz, carrying gold, silver, lead and zinc, and averaging around \$8 a ton. Development consists of a 412-ft. incline shaft, about 1000 feet of drifts, a crosscut tunnel on the river level in 1085 feet and now being extended, another crosscut of 225 feet, a 150-ft. raise and several stopes. The long crosscut tunnel when it taps the vein will give 1000 feet of backs on the dip.

The property is equipped with an old 10-stamp mill gone to ruin; 35-h.p. steam engine, 60-h.p. boiler, and pumps, also a steam hoist and boiler and compressor at the adit portal, mill building, blacksmith shop, bunk house, etc. Work is being continued.

Bouvier Property (Carson) consists of 483 acres of agricultural land and several mineral claims located in Hunter Valley in Secs. 3 and 4, T. 4 S., R. 16 E., about 12 miles north of Hornitos. Temperance Creek runs through the property. There is an old shaft 125 feet deep and several other shallow prospect shafts. The shaft is located on a cross vein about 150 feet west of the main ledge, the so-called 'Blue Lead,' which varies from 2 to 20 feet in width. The cross veins are from 2 to 4 feet wide. There was a 5-stamp mill on the mine when it was operating in 1868, but the mill burned down, and no mining has been done since.

Buena Vista Mine (see Washington-Buena Vista Group).

Bunker Hill Claim (Squirrel Mine). Owned by Harry Taylor, Mariposa. This is an old claim located near Hite Cove on the South Fork of Merced River about six miles southwest of El Portal. It was discovered by quartz brought to the surface from a squirrel hole, hence the original name, Squirrel Mine. There was considerable work done on it in the early days; one of the first quartz mills in the state, with wooden stamps being in operation here in 1851. It was again active for a short time about 1920, but has been idle since.

B. V. D. Mining Company was organized in 1921 to acquire six unpatented mining claims; the Rich-Luckett, Arcturas, Day Break, Moore Hill, Arcturas No. 9 and Arcturas No. 7, located on a new discovery about one-half mile southwest of the Bobbie Mining Company's property near Cathay. The country rock and ore were reported similar to that at the Bobbie Mine, and the same type of mill, using the Vandercook patented process, was erected; but this company also ceased operations in 1923, and the mill has since been removed. Idle.

Carrie Todd Mine. This is a patented claim of 20 acres, located in Secs. 7 and 8, T. 3 S., R. 18 E., in the Kinsley or Bull Creek district, two miles west of Kinsley; owned by Estelle I. Fraser and Geo. Frank, Coulterville. These parties also own the *Fraser and Frank Group* of eight unpatented claims in the same locality. The Carrie Todd was located about 25 years ago. It has been bonded a number of times and has been active at intervals up to the present. The property is near the top of the precipitous east bank of the North Fork at an elevation around 3000 feet.

The vein is from 2 to 4 feet in width between slate walls. It strikes west and dips 75° N. It has been developed by three tunnel levels, each several hundred feet in length, with a winze connecting the middle tunnel with the lower one. There are several mills on the property, including a 3-stamp mill, a 2-stamp mill and a 1-stamp mill. Machinery for a new 10-stamp mill was on the ground in 1920 but not erected. There is also a compressor and two gas engines. (See also, Gentry Gulch Consolidated Mines Co.)

Cardoza Prospect. Cardoza and Fagundes are developing a prospect in T. 5 S., R. 17 E., in the Moore Hill district, on which there is a ledge from 30 inches to 3½ feet wide. They have run a 200-ft. drift on it. The vein carries free gold and sulphides.

Castagnetto Mine. Owned by George K. Allen, 328 Olive avenue, Piedmont, California, who purchased it from the Castagnetto Estate in 1925. The mine is situated in Hunter Valley in Sec. 15, T. 4 S., R. 16 E., about nine miles by road north of Hornitos. Prior to Allen's ownership it was last worked by C. H. Burt under lease in 1916. The vein is between porphyry walls and averages about 18 inches in width. It is developed by an incline shaft 150 feet deep with drifts 100' and 60' west on the 70-ft. level. The strike is northwest and dip southwest. Allen has discovered a new prospect on adjoining patented land of the Castagnetto ranch one-half mile from the other workings. The holdings cover one and one-quarter miles along the vein, which is southwest of and parallel to the so-called 'Blue Lead.' A Straub mill is being installed. Water can be obtained from Cotton Creek.

Champion Mine is a patented property of 15 acres, situated two miles north of Coulterville in Sec. 28, T. 2 S., R. 16 E., owned by Mrs. N. C. Ray, Mrs. Mary A. Mentzer et al., Coulterville. It is on the bank of Blacks Creek at an elevation of 1650 feet. A quartz vein, from 6 to 12 feet in width, occurs between slate walls. The strike is N. 17° E. and dip 45° SE. The ore carries free gold, galena, sphalerite and tetrahedrite.

Development consists of an incline shaft 250 feet deep, another shaft 200 feet deep, connected with the first by drifts and several stopes. About 1914 the mine was leased by C. I. Mentzer et al., of Coulterville, who milled several thousand dollars worth of ore in the Potosi mill, which averaged around \$45 a ton. A little later it was leased by a Los Angeles company which put on a 10-stamp mill, but operations were short lived and the mine has now been idle for nearly ten years. Both the P. G. & E. and the San Joaquin Light and Power Company's power lines cross the property.

Cleveland Mine. Property comprises the Cleveland, Cleveland Extension and Cannon Gulch placer claims. Owned by Harry Taylor, Mariposa. There is an old shaft 86 feet deep, which caved in 1923, and a 130-foot drift; also several old glory holes on top of a 5-foot ledge. Most of the pay taken out was on the hanging wall. The ledge strikes west and dips 70° N. It lies close to the Buena Vista Mine. Idle.

Colorado Mine consists of the patented Colorado claim and three unpatented claims situated in Sec. 27, T. 4 S., R. 18 E., about seven miles north of Mariposa near the head of Saxon Creek. Owners, Chas. H. Weston, 433 Ninth street; P. W. Jenkins, 1015 Nevin avenue, and Mrs. Emma Dearborn, 328 Second street, all of Richmond, California. The elevation is 3000 feet and the topography fairly rough. The claims are well timbered and sufficient water for milling is available from the creek.

The mine is on the well-known Colorado fissure vein, which can be traced through the Colorado (locally pronounced, Colorow) district for several miles and on which a number of the principal properties in this area are situated. The vein strikes northwest and dips 60° to 80° NE. It varies from $2\frac{1}{2}$ to 7 feet in width, between slate walls.

At the Colorado Mine the vein has been developed by an incline shaft and 500-foot working adit level from the mill, which intersects the shaft at the 125-ft. level. There is another level (drift) 200 feet in length from the shaft, 30 feet above the working adit, and other workings, including several raises and a stope 120 feet long by 35 feet high. The shaft was sunk 100 feet below the adit level, but no development work was done at the bottom. Sampling of the vein where exposed in the workings as shown on a map of the mine indicated values from \$4.50 to \$27 a ton. About 2500 tons of ore milled when last worked averaged \$10 to \$11 a ton with some development rock going \$8. The ore is a banded quartz and free-milling.

There is a gas engine hoist and Cornish type jack-head pump at the shaft, and 10-stamp mill at the adit entrance. The mill contains a crusher, 10 stamps with Challenge feeders, two 5-ft. by 10-ft plates, two Gates concentrators, tables and two vanners. Two gas engines were used for power. The equipment also includes a 2-drill Rix compressor and several buildings. The mine has not been operated since 1917, at which time it was under lease to Mitchell and Ward.

Consolidated Gold Fields of Mariposa, Inc., was organized in November, 1927, to develop and operate the various mining properties that have been purchased, located or otherwise acquired in Mariposa County during the past year by Belle McCord Roberts of Long Beach. The mines controlled include the Washington-Buena Vista Group, Artru Mine, Spread Eagle Group, King Saxon and Queen Saxon, Sebastopol, Mountain Belle Group, and other holdings, a total of 34 claims together with several tracts of patented mineral land.

The capitalization of the corporation is \$3,000,000, and its directors are Belle McCord Roberts, G. A. Smith, M. R. Streeter, R. A. Whittfield and C. Nelson of Long Beach, and W. A. Alderson and M. Mellin of Los Angeles. A little development work was started at one of the mines late in 1927. (See Washington-Buena Vista Group.)

Crown Peak Mine consists of the Crown Peak and mill site patented claims, situated in Secs. 35 and 36, T. 3 S., R. 16 E. It is about two miles northwest of Bagby, near the top of the steep ridge that rises from the east bank of Merced River. The elevation is over 2000 feet. There is no timber or water on the property. Two quartz veins occur on the contact between a serpentine footwall and slate hanging wall. They vary from 6 to 8 feet in width, strike northwest and dip 65° NE.

The owner is George E. Gamble, 1431 Waverley street, Palo Alto, California. The mine has been idle for many years, but in 1927 it was taken under lease and bond by the Gray Eagle Mining Company. This company is extending an adit begun near the river level, which will cut the vein at a depth of 350 feet.

Diana Mines consist of eight claims, Diana No. 1 to No. 8, inclusive, located on the east belt in Secs. 30 and 31, T. 2 S., R. 18 E., owned by *California Gold Mines, Inc.*, care of Mrs. E. M. Coplen, 1535 North Hobart street, Los Angeles; formerly owned by *Diana Mining Company*, of San Francisco. Not active.

Diltz Mine consists of the Diltz and Mann patented lode claims, situated in Sec. 29, T. 4 S., R. 18 E. Owned by Jennie E. Diven, 147 Kempton avenue, Oakland, et al. The same parties also own the Vanderbilt patented claim in Secs. 1, 2, 11 and 12, T. 5 S., R. 19 E., and the Ohio Placer and Johnnie F. claims, adjoining the Diltz and Mann in Sec. 29, T. 4 S., R. 18 E. The Diltz Mine is in the Whitlock district, about six miles northwest of Mariposa. The elevation is 2850 feet, topography rough and well timbered. Water is obtained from springs.

The Diltz and Mann claims were first located in the 60's. There is a quartz vein averaging 20 inches in width, of which 10 inches is ribbon quartz, on the contact between a porphyry footwall and slate hanging wall. It strikes northeast and dips 45° SE.

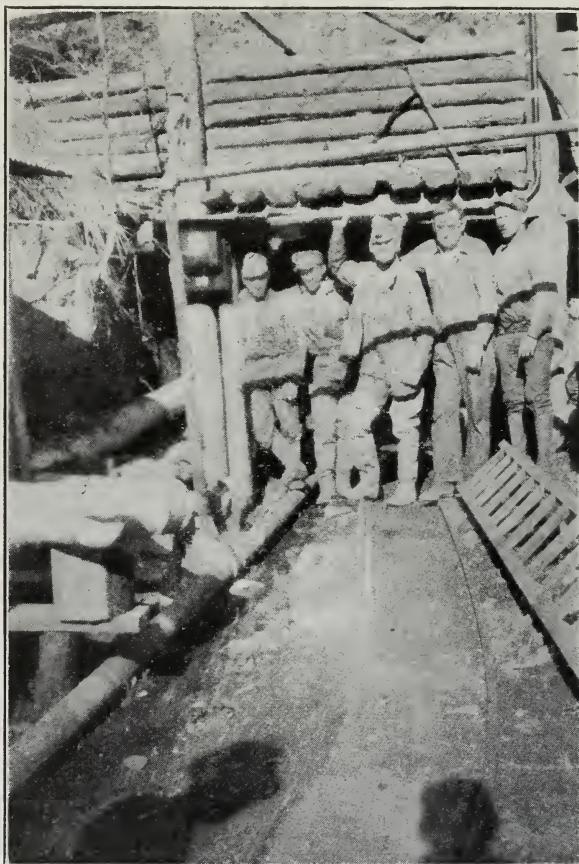
The property was under bond in 1914 to *Mariposa Mines and Development Company*, C. A. Schlageter, T. L. Diven, et al., who did some development and shipped some ore. In 1919-20 two men were working, driving a tunnel to cut the ledge. At that time it was in 300 feet. During 1927 the Diltz has been worked by George Ahart of Mariposa, who extended the tunnel to the ledge, then turned and has drifted 200 feet on the vein. Work is being continued by Ahart, and a 10-stamp mill is being installed.

Duncan Mine is a patented property, containing 44 acres, located in Secs. 16 and 21, T. 5 S., R. 16 E., about one mile southeast of Hornitos. It is on the Turner ranch and is owned by George Turner, Hornitos. The deposit is of a pockety character, the veins occurring in porphyry and amphibolite schist. It has been worked intermittently by leasers and has produced some high-grade ore. In March, 1920, a pocket of gold, valued at over \$1,000, was uncovered by David Onito and his partner, who were then operating it. In 1926 a company known as the *Duncan Mining Company*, composed of E. S. Hunter, A. H. Allice, D. A. Casad, C. Hausseding, E. G. Casad and Bert Thurber of Oakland, John Rowe of San Francisco, and D. L. Onito of Hornitos, began development and have continued work on a small scale with but few interruptions up to the present. David Onito, Hornitos, is manager.

El Capitan Gold Mining Company. This company, which was incorporated in Nevada April 13, 1925, with capital of \$100,000, controls a group of 14 claims situated in Sec. 22, T. 3 S., R. 19 E.; address, care of James H. Eaton, Union League Club, San Francisco. The property is only a short distance above the Original Mine, but on the opposite or south side of Merced River. Some development work was carried on until late in the summer of 1927 on a vein which is supposed to be the same as that worked in the famous Hite Mine nearby.

Eureka Mine comprises a single claim, located on Mt. Buckingham not far from the Mt. Buckingham group, in T. 4 S., R. 19 E. Owners, F. M. Skelton and J. C. Donnelly, Jerseydale. There is a road to within one-half mile and then a good trail to the claim, which lies at an elevation of 3000 feet. Timber is abundant and water is obtained from the mine and springs.

The deposit is a quartz vein, having a width of 18 inches between slate walls. The average value of 12 samples taken from the dump and in the upper tunnel is reported as \$26.12, of which over \$10 is in free

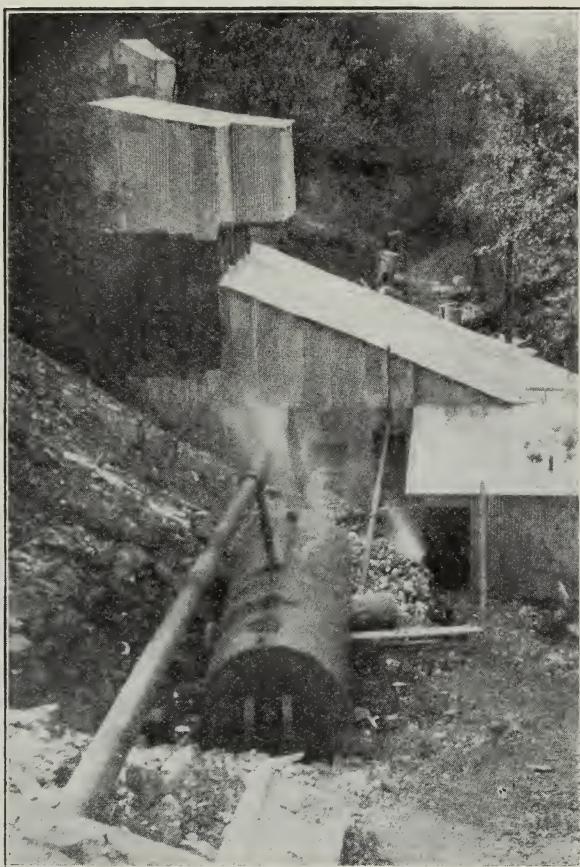


Entrance to main adit level, Feliciana Gold Mine,
Mariposa County.

gold. The vein has been developed by two tunnels; the upper one, 360' in length, gives a depth of 150'; the second, 100' lower in elevation, is in 415'. There is no equipment, as only assessment work is being done.

Feliciana Mine consists of the patented Feliciana claim and millsite and four unpatented claims, having a total area of 105 acres, situated in Secs. 7 and 17, T. 4 S., R. 19 E., in the Hite Cove district. Owner Feliciana Gold Mining Company, Inc., 462 Phelan Bldg., San Francisco; M. Farber, president; George Zillinger, vice president; Pauline

Farber, secretary; mine address, Box 14, Mariposa. The original Feliciana claim was discovered in the 50's and is said to have had a 10-stamp mill on it in the early days, that was later removed. It had been idle for 30 years prior to 1918, but in 1920 was under lease to J. B. Coyle of Fresno, who worked it at intervals in a small way for a year or two. In 1924 the mine was acquired by M. Farber and associates of San Francisco. Development work was continued and four additional claims were located. The present company was organized in 1925 and the mine has been continuously active since.



45-ton capacity mill at Feliciana Gold Mine,
Mariposa County.

The mine is situated at an elevation of 3500 feet in the rugged area near the head of Feliciana Creek, about $2\frac{1}{2}$ miles by trail southwest of Briceburg. It is reached by road in fair condition as far as Jerseydale, but with steep grades, and almost impassable in winter from Jerseydale to the mine. It is within the forest reserve and there is a fair stand of timber on the claims. Water for milling and domestic use is obtained from the mine and springs.

There is one principal fissure vein which has been traced on the surface for several thousand feet. It strikes northwest and dips 75° SW., varying in width from $1\frac{1}{2}$ to $4\frac{1}{2}$ feet. The country rock is a metamorphic schistose or slate-like siliceous rock containing some carbonaceous matter. It shows evidence of considerable movement along the vein. A secondary vein dipping in the opposite direction intersects the main fissure at an angle of about 20° and an ore shoot is developed along the intersecting plane. There are two other small unexplored cross veins coming in on the footwall side.

The mine is developed by a 340-ft. crosscut adit to the vein. On this level there is a drift north 156 feet and south 160 feet. This level is connected with the next lower one by a winze on the vein equipped with a 30-h.p. motor, hoist and skip. The lower level is drifted north 274 feet and south 200 feet. This south drift is being continued to get under an ore shoot showing on the surface south of the present workings.

A power line of the San Joaquin Light and Power Company, 12 miles in length, was completed to the mine in September, 1927, since which time electric power has been used at both mine and mill, the mine workings being electric lighted. There is a 10-h.p. fan for ventilation.

Ore from the main adit is trammed to the mill bin and passes over a grizzly, the oversize going to a 10" by 12" Blake crusher discharging to the mill feed bin. From here the ore is fed by a Challenge feeder to a 45-ton capacity Hendy ball mill, using steel balls. The ball mill discharge is conveyed by a bucket elevator to a 40-mesh screen above the ball mill and plus 40-mesh material returns to the circuit, the minus 40-mesh going to two 4' by 8' plates and then to a Deiser table. The tailings are impounded and concentrates, which run about \$100 a ton, are shipped. Mill heads average \$15 to \$20 a ton. One 30- and two 10-h.p. motors run the mill. A 12" by 14" Rix-Gardner air compressor, operated by a 50-h.p. motor, is housed in the mill building.

Other equipment includes a blacksmith shop with Sullivan drill sharpener and heater, assay office, substantial bunk house, boarding house, with electric refrigeration, office and other buildings. Six to 15 men have been employed during the past year.

Geare Mine (Geary). This is a patented claim of 20 acres, located in Sec. 30, T. 4 S., R. 18 E. in the Whitlock district, about six miles northwest of Mariposa; owned by Jesse S. L. Potter, care of J. S. Potter, 214 American Bank Building, San Francisco; elevation, 2800; topography, fairly rough, with little timber and water only from the mine. There is one vein on the contact between slate and porphyry. It averages 3 feet in width, strikes northwest and dips 80° NE. Old workings include an incline shaft 100 feet deep and 325 feet of drifts. There is no equipment. The mine has been idle for years, though said to be a promising property.

Gentry Gulch Consolidated Mines Company. Thomas Allen Box, president, 225 California street, San Francisco. This company is consolidating under one ownership a number of old properties in the Red Cloud, Bull Creek or Kinsley district. The area in which these mines are situated is steep and rugged, the elevation varying from 1800 to 4000 feet. It is drained by Bull Creek and North Fork of Merced

River. The district lies entirely within a belt of Calaveras slate. Most of the properties were first located in the early days and have been idle for many years. Some of them have made considerable production. A few have been more or less active during the past ten years.

The mines taken over by Gentry Gulch Consolidated Mines Company include the *Scanlon Group* of six claims, located in Sec. 7, T. 3 S., R. 18 E., owner Mrs. Annie A. Scanlon, 601 41st avenue, San Francisco; the old *Hasloe Mine*, comprising two patented claims in Secs. 1 and 2, T. 3 S., R. 17 E., owned by J. S. Morgan and Sons, 614 Third street, San Francisco; the *Bandarettta* (Bandarita) and the *Star*. Other properties which may be included in the consolidation are the *Twin Tunnels*, the *Carrie Todd*, the *Texas Hill*, *Martin-Walling* and possibly other claims.

Givens Prospect. This prospect is in Sec. 22, T. 6 S., R. 17 E., on the ranch of Geo. R. Givens of Cathay. It was discovered a good many years ago, and, according to reports, a shaft 40 feet deep was put down, the ore being shipped to Selbys. Returns of \$100 a ton, mostly in silver, are said to have been received. Considerable water came in at that depth and mining ceased. The hole has since caved and is now nearly filled. The ledge is about 18 inches wide at the surface and can be traced for a mile. Considerable quartz, some highly mineralized with pyrite and silver sulphides, lies around the top of the hole.

Gold King Mining Company, a Nevada corporation, owns the Gold King Group of six claims, situated in Secs. 19 and 32, T. 2 S., R. 18 E.; address, Box 1648, Modesto, California; J. E. Brown, Coulterville, superintendent. Work was carried on at this property during the year 1926 and up to May, 1927, since which time it has been idle. An adit was driven 1445 feet, which it is believed cut through the ledge at about 1385 feet from the portal. Development will be continued in 1928 by coming back 60 feet and exploring the ledge that was apparently passed by.

Golden Gate Group (Schlageter Mine) comprises two claims, situated in Sec. 19, T. 4 S., R. 17 E., about two miles northwest of Bear Valley near the Bear Valley-Hornitos road; owned by C. C. Schlageter of Mariposa. Two quartz veins occur on the property on the contact of slate and mariposite. The veins vary from 3 to 6 feet in width, strike northwest and have a nearly vertical dip. There is a shaft 210 feet deep, an adit level and crosscut to the vein. Intermittent work has been carried on here, including some development during 1927, and there is considerable ore on the dump.

Gray Eagle Mine (Blue Jay) consists of two claims, the Gray Eagle, located in 1894, and the Stella, in 1912. Owned by the *Gray Eagle Mining Company, Inc.*; G. B. Turennetti, president; John D. Turennetti, vice president; Harry Tizor, secretary; H. H. Bever, treasurer; Geo. W. Bever, manager, Coulterville, California. The property is in Sec. 30, T. 3 S., R. 17 E., about four miles by road north of Bagby. Elevation, 1700 feet.

There are two veins between a serpentine footwall and porphyry and slate hanging wall. They strike northwest and dip about 50° NE. The mine is developed by a shaft 133 feet deep and adit level

200 feet long. There is a 155-foot drift on the second level and 300-foot crosscut on the adit level; one stope 60' by 20' by 40' high and one 60' by 12' by 35' high. Equipment includes a 40-h.p. gas-engine hoist and 75-ton Gibson mill. There is no water available except from the mine. The gold was free until the water level was reached, when sulphides appeared, and as a different mill treatment was required, the mine was closed down. The company has recently taken a lease and bond on the Crown Peak Mine, which see.

Hite Gold Mine. This property is situated at Hite Cove on the South Fork of Merced River, in Sec. 27, T. 3 S., R. 19 E. It has a production record of close to \$3,000,000 and was one of the most noted mines on the east belt. The Hite, Priest, McConley, Giltner, Old Dominion claims and four millsites, comprising 60 acres are patented. Owner, James S. Spillman, 244 Kearney street, San Francisco. The Arkell Group of eleven additional claims adjoining are assessed to Charles Arkell of Jerseydale, caretaker of the Hite Mine.

The Hite was located about 1863 and the mine was active for 20 years. It was closed down in 1882 and little has been done since. The vein strikes N. 70° W. and dips northeasterly. It is accompanied by numerous branches, mostly into the hanging wall. At one place the vein splits, one branch making into the footwall in a sweeping curve and reuniting with the main fissure about 600 feet from the point of departure, inclosing a lens-shaped mass of slate, 45 to 50 feet thick at the center. The surface croppings of quartz, a few inches to 12 feet in width, were studded with gold and the discoverer, though penniless at the time, soon pounded out enough gold in a hand mortar to carry on development and later build a mill. The vein was extensively developed to a depth of 900 feet but there has been little exploration on the hanging wall side, and as the fissure was still strong at the lowest level worked, further development by diamond drilling, or otherwise, might easily be rewarded by the repetition of the rich ore shoots at lower depths.

Horse Shoe Bend Mining Company is a California corporation, organized January 13, 1922, with a capital of \$500,000. The company held an option to purchase 13 unpatented and 1 patented lode mining claims from *Merced River Mines Company*, 319 De Young Building, San Francisco. This group of claims is located in Secs. 15, 16 and 22, T. 3 S., R. 16 E., three miles south of Coulterville and one-half mile from Mast station on the Yosemite Valley Railroad. There are four veins, varying from 1 to 4 feet in width between a slate footwall and serpentine hanging wall. They strike northwest and dip 50° NE. Over 1100 feet of development work has been done. This property was not visited, and nothing was learned regarding any operations that may have been carried on by the Horse Shoe Bend Mining Company. Taxes on the Horse Shoe Group for the year 1926-27 were assessed to Clara Bibbero and David A. Green, care of D. H. Green, 2524 Mission street, San Francisco.

Jenkins Hill Mine comprises the White Oak and one other claim located in Sec. 18, T. 3 S., R. 19 E., adjacent to Yosemite Portland Cement Company's limestone quarry. Owned by W. J. Schofield of

Oakland, and A. B. Smith, 625 Call Bldg., San Francisco. The mine was under option in 1919 and some development work was done. Intermittent work has also been done during the past two years, the last in July, 1927. A lower adit has been driven 90 feet below the old adit, 432 feet. A raise on the vein connects the two. The vein is from 4 inches to 3 feet wide, composed mainly of sugar quartz, and the values are in sulphide minerals, there being practically no free gold. The footwall is granite and hanging wall slate. Electric power is now available and completion of the Yosemite highway has made the property readily accessible. It is expected that work will be started again within a few months. It is said the second mill built in Mariposa County was on this property. It was swept away in the flood of 1862.

Josephine and Eureka Claims are located on a large dike of base ore in the Jerseydale district. Owned by J. C. Donnelly et al. of Jerseydale. There is an old drift, now caved, but no other development.

Josephine Mine. The Josephine proper comprises one claim located in Sec. 16, T. 4 S., R. 17 E. It is one of the noted mines belonging to the Mariposa 'Grant,' and its output was largely instrumental in paying off the debt with which the 'Grant' was originally saddled. It adjoins the Pine Tree and the two are usually operated as a single property. The Josephine is three miles southeast of Bagby. The elevation is 2100 feet, topography rough and sparsely timbered. Water is obtained from Bear Creek.

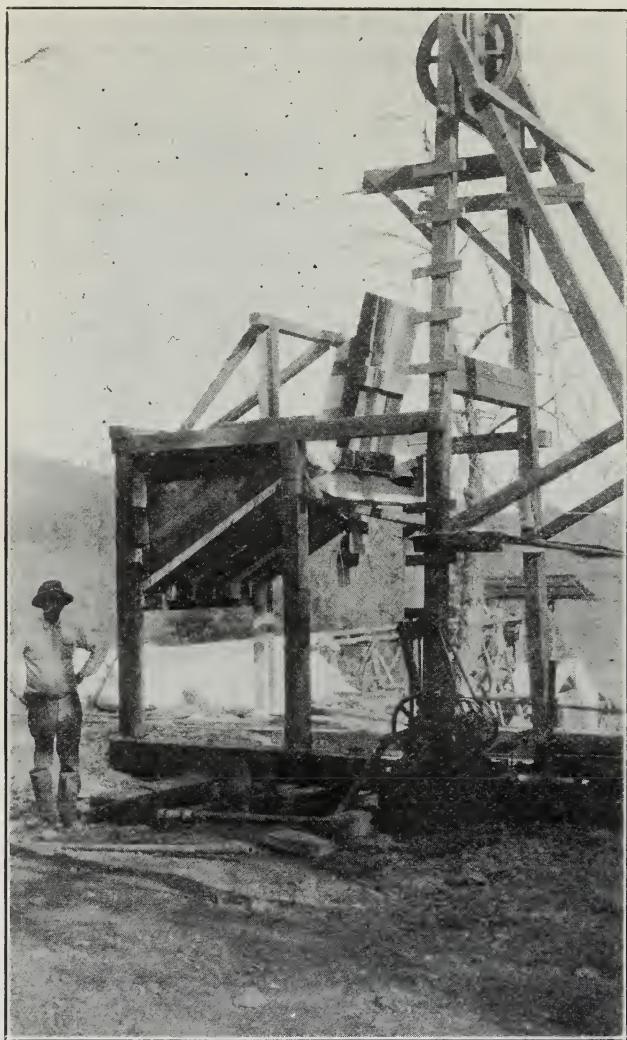
There is one quartz vein, averaging six feet in width, between slate walls. It strikes a little west of north and dips 55° NE. The underground workings are extensive, consisting of a 500-ft. shaft with four levels and several thousand feet of drifts, crosscuts, raises and stopes. One stope is 500 by 200 by 4 feet in size. Subsequent to early operations by the company, it has been worked mainly by lessees. From 1900 to 1915 lessees of the Josephine and Pine Tree produced \$371,749 from 29,968 tons of ore. An electric power line crosses the ground. The Josephine is credited with a total production of over \$1,000,000.

In 1927 this property and the adjoining Pine Tree were leased to Thos. H. Lipps, 206 Financial Center Building, Los Angeles. Mr. Lipps is president of the Vallecito Mining Company, which is working a rich gravel channel in Calaveras County, and it is presumed that the latter company or a subsidiary controlled by the same interests will shortly start work at the Josephine and Pine Tree.

Jumper Mine. Property consists of two claims covering a discovery originally made in the early 50's. Owner, C. H. Burt, Mt. Bullion, California. This mine is situated in Sec. 30, T. 4 S., R. 16 E., on the nearly level top of Bear Valley Mountain, at an elevation of 3000 feet. It is approximately ten miles to either Hornitos, Mt. Bullion or Bagby, the latter being on Yosemite Valley railroad.

There are two flat parallel veins cut by the present incline working shaft, 180 feet deep, which follows the second or bottom vein. This is a laminated quartz vein, varying from a few inches to 4 feet in width, carrying free gold too fine to be seen with the naked eye. Operation was started by the present owner in 1917, and has been carried on ever since on a small scale, with one to three men employed. The mine is

equipped with a 20-ton Gibson mill. Gasoline engines are used for power. Water for milling purposes is very scarce, but enough rain-water is collected in a reservoir for occasional mill runs. The lowest mill run made recovered \$19 a ton. There are four other shafts which have been used at various times in the past. In spite of the fact that



Shaft at King Midas Prospect; mill in right background.
Mt. Bullion, Mariposa County.

this property has been worked off and on since the 50's and almost continuously in a small way since 1917, a stock-raising homestead entry has been filed over it, and the mine owner is compelled to contest it in order to preserve even a water hole for panning tests.

King Midas Mine. This is a new discovery on the 'Mariposa Grant' made in 1925. The King Midas comprises one claim under lease and

bond to J. N. Knight and associates of Mt. Bullion. It is located in Sec. 8, T. 5 S., R. 18 E., one mile east of Mt. Bullion and within 100 feet of the Mariposa-Mt. Bullion road. The deposit occurs along the contact of slate on the west and a serpentine belt on the east. The contact zone, about 100 feet in width, is composed mainly of chlorite schist, which is traversed by six parallel dikes or ledges of talcose rock that carry free gold in seams and along joint planes and fractures, with a small amount of sulphides. The vein dikes are all about 18 inches in width at the surface. They strike northwest and dip 70° NE. A narrow quartz vein, barren at the surface, also occurs on the west near the slate contact. Except for a few surface cuts, development has been confined to only one talc vein. There is one incline shaft 50 feet deep, and 200 feet southeast of this, another vertical shaft 100 feet deep. The latter shaft cuts the vein at 40 feet depth, at which point there is a 6-inch gouge containing finely broken up quartz. A cross-cut run east 40 feet at this level cut a vein 6 feet wide. It is thought that these dikes will unite with the quartz vein at a minimum depth of 300 feet, and that they have robbed the quartz vein of its gold above the junction.

The mine is equipped with a gasoline hoist and Huntington mill with plate, run by gas engine. Talc vein matter taken out in sinking has given an average recovery of \$10 to \$15 a ton in mill runs. The sulphides which are not saved assayed \$190 per ton; mill tailings \$4.29, indicating a poor recovery of the values. Some fairly rich rock has been encountered showing free gold plainly visible. Sinking is being continued with two to six men employed.

King Saxon and Queen Saxon Claims. These claims, situated in Sec. 21, T. 4 S., R. 18 E., have been acquired recently by Belle McCord Roberts, Long Beach, California. They are about ten miles by road north of Mariposa. The claims were not visited by the writer. It is reported that a quartz vein occurs in a slate belt on which the claims are located. The vein is from 1 to 5 feet in width, strikes north with a flat dip to the west, cutting through the bedding plane of the slate at an angle of 45° to 50°. There is a lower tunnel 450 feet in length, and 80 feet above it another tunnel 300 feet long, both on the vein. Some ore was stoped from the lower tunnel by former owners. A placer claim also has been located alongside the King Saxon, taking in the bed of Saxon Creek, from which water can be obtained. There is a crusher, 6-ft. Huntington mill and gas engine on the property. Samples from the King Saxon are reported by Techow and Davis, Sacramento, to assay as follows:

King Saxon: face of upper tunnel-----	Gold \$3 69 a ton
King Saxon: 4 feet of ore, 60 feet from face-----	Gold 4 12 a ton
King Saxon: hole in bottom of tunnel-----	Gold 22 40 a ton
King Saxon: lower tunnel drift-----	Gold 5 60 a ton
King Saxon: 2 feet of quartz near lower tunnel face-----	Gold 3 80 a ton

Lafayette Mine (Ghirardella) is an old property on patented agricultural land, owned by Dr. C. A. Queirolo, 892 Isabella street, Oakland. It was worked in 1866-67 and has been idle since. It is situated in Hunter Valley, in Sec. 15, T. 4 S., R. 16 E., about 12 miles north of Hornitos. The country rock is porphyrite, and the vein is on the so-called 'Blue Lead.' A shaft was sunk to water level, a depth of about 150 feet. It is claimed the vein was 2 feet wide at the bottom

northeast of Bear Valley in Secs. 15 and 22, T. 4 S., R. 17 E. Owner, John Naimo, Bear Valley. Timber and water are available for mining. The main vein strikes northwest and dips about 90° NE. Several smaller veins up to 5 feet in width have also been prospected. Development consists of seven shafts, 30' to 40' in depth, and four tunnels, 200', 100', 65' and 25' in length. Assays from \$30 to \$1100 a ton are reported. Black slate forms the vein walls. Equipment consists of hand tools. Application for patent is being made.

Louis Mine; one of the 'Mariposa Grant' properties, located in Sec. 11, T. 5 S., R. 17 E., about $1\frac{1}{2}$ miles west of Mt. Bullion. Elevation, 2150 feet, topography rough, with no water and no timber. There are two quartz veins, averaging 4 feet in width between slate walls. The ore is free-milling. Development consists of a 400-ft. shaft with two levels; 500 feet of drifts on the upper level and 424 feet on the lower one. There is also a 350-ft adit level, a 115-ft. crosscut, 150 feet of raises and a stope 180 by 80 feet. The Louis was worked intermittently between 1900 and 1912, when it was last active, with a total production during that period of 1240 tons, having an average value of \$22.36 a ton.

Louise Mine; one of the holdings of A. S. Bigelow and G. M. Hyans of Boston. (See *Merced Gold Mining Company*.) The Louise is situated on the edge of the town of Coulterville, in Sec. 3, T. 3 S., R. 16 E. The elevation is 1700 feet. Maxwell Creek runs though the property. The quartz vein of the Mother Lode is very massive on this property, it being 20 or more feet in width and outercropping boldly. Development consists of a vertical shaft, 375 feet deep, with three levels. There are 275 feet of drifts on the 100-foot level, 75 feet on the 200-foot level and 500 feet on the 300-foot level, 775 feet of crosescuts, a 150-foot air shaft and 600 feet of winze on the vein. There is no equipment, the ore having been formerly milled at the Potosi mill. It has not been active for many years.

Louisiana Mine consists of one patented claim in Secs. 25 and 26, T. 2 S., R. 17 E., adjoining the Bondurant. Owned by C. P. Treat, 426 Palo Alto avenue, Palo Alto, California. The vein is in slate and varies from 1 to 5 feet in width. It strikes N. 60° W. and dips 45° NE. There is an incline shaft 275 feet deep and a tunnel 150 feet in length. Idle.

Lovely Rogers Mine consists of one patented claim in Sec. 11, T. 3 S., R. 17 E., about nine miles east of Coulterville. Owned by Mrs. Nettie Hanck of Yosemite. The elevation is 2400 feet, topography rough with very little timber or water. There are three veins, varying from $1\frac{1}{2}$ to 2 feet in width. The walls are slate. The mine was developed by a shaft, 100 feet deep; 3 adits, 400, 300, and 250 feet long, and other workings. It was at one time equipped with a mill, but this has been removed. Idle.

Lucky Spot Prospect consists of one claim of 20 acres in Sec. 14, T. 4 S., R. 17 E., in the Sherlock district, six miles east of Bagby. Owner, George Marten, Bagby, California. It is developed by a tunnel 300 feet long, giving 200 feet of backs, and a shaft 40 feet deep. The ore

is said to run from \$10 to \$30 a ton and there is about 100 tons on the dump. The claim is for sale.

Malvina Mine is another of the properties owned by A. S. Bigelow and G. M. Hyans of Boston. (See *Merced Gold Mining Co.*) The Malvina is in Sec. 4, T. 3 S., R. 16 E., a mile west of Coulterville. It was extensively worked in early days, the ore being hauled through the Potosi tunnel by mules to the Potosi mill. Development consists of a vertical shaft 1000 feet deep, another incline shaft, 875 feet deep; 1275 feet of drifts on the Potosi tunnel level, 400 feet on the 44-ft. level, 387 feet on the 600-level, 225 feet on the 900-level, and 1225 feet of crosscuts. The mine is equipped with a large steam Corliss flat-cable hoist. The ore was low grade, averaging around \$4 a ton, and it could not be worked at a profit as equipped. The mine has been idle for many years.

Malone Mine (Bear Creek Gold Mine); a patented property consisting of five claims, located in Sec. 5, T. 5 S., R. 19 E., about seven miles northwest of Mariposa near the head of Bear Creek. The elevation is 2600 feet, topography fairly level and plenty of water for milling purposes. Six separate veins, averaging 1 foot in width but reaching a maximum of 4 feet, occur in granite. They strike north and dip 33° W. Development consists of a shaft 150 feet deep, a 600-ft. crosscut adit level and stope 300 feet long, 90 feet high and 3½ feet wide. The mine is equipped with a 10-stamp mill and steam power plant. It was leased to and was being worked by William Johnson in 1919–20, and had previously been worked to some extent by Thomas Gordon and associates. Idle.

Marble Springs Mine (Compromise). This is an old property said to have had one of the first stamp mills built in the state, consisting of wooden stamps. After being idle for nearly 40 years, it was opened up again about 1920. The property comprises two patented claims, the Compromise and Eubanks, having a total area of 42 acres, and situated in Secs. 30 and 31, T. 2 N., R. 18 E., in the Kinsley district, 14 miles by road east of Coulterville. It is owned by the *Marble Springs Gold Mining Company*, 547 Central avenue, Alameda, California. The mine is in a rugged area; elevation 2800 feet. There is one vein from 2 to 5 feet wide between a slate footwall and diorite hanging wall. It strikes northeast and dips 47° southeast. A good deal of development work has been carried on here during the past several years, and some production has been made from milling ore, but the mill and other equipment was destroyed by fire in 1926, since which time operations have been curtailed. It has been one of the large producers of the east belt. D. G. Kidder, superintendent.

In October, 1926, the mine was reported sold to *California Gold Mines, Inc.*, a Nevada corporation.

Mariposa Commercial and Mining Company. This company is the owner of the famous 'Mariposa Grant' (Fremont Grant), 'Las Mariposas,' an estate containing some 44,500 acres, about 70 square miles, of land shown on the accompanying map. The officers and directors of the company are: Edward H. Benjamin, president; William W. Mein,

vice president; Howard G. Stevenson, secretary-treasurer; Charles W. Slack and Frank T. Maguire. Office, 308 Finance Building, 580 Market street, San Francisco. Andrew Zinkand, manager, Mt. Bullion.

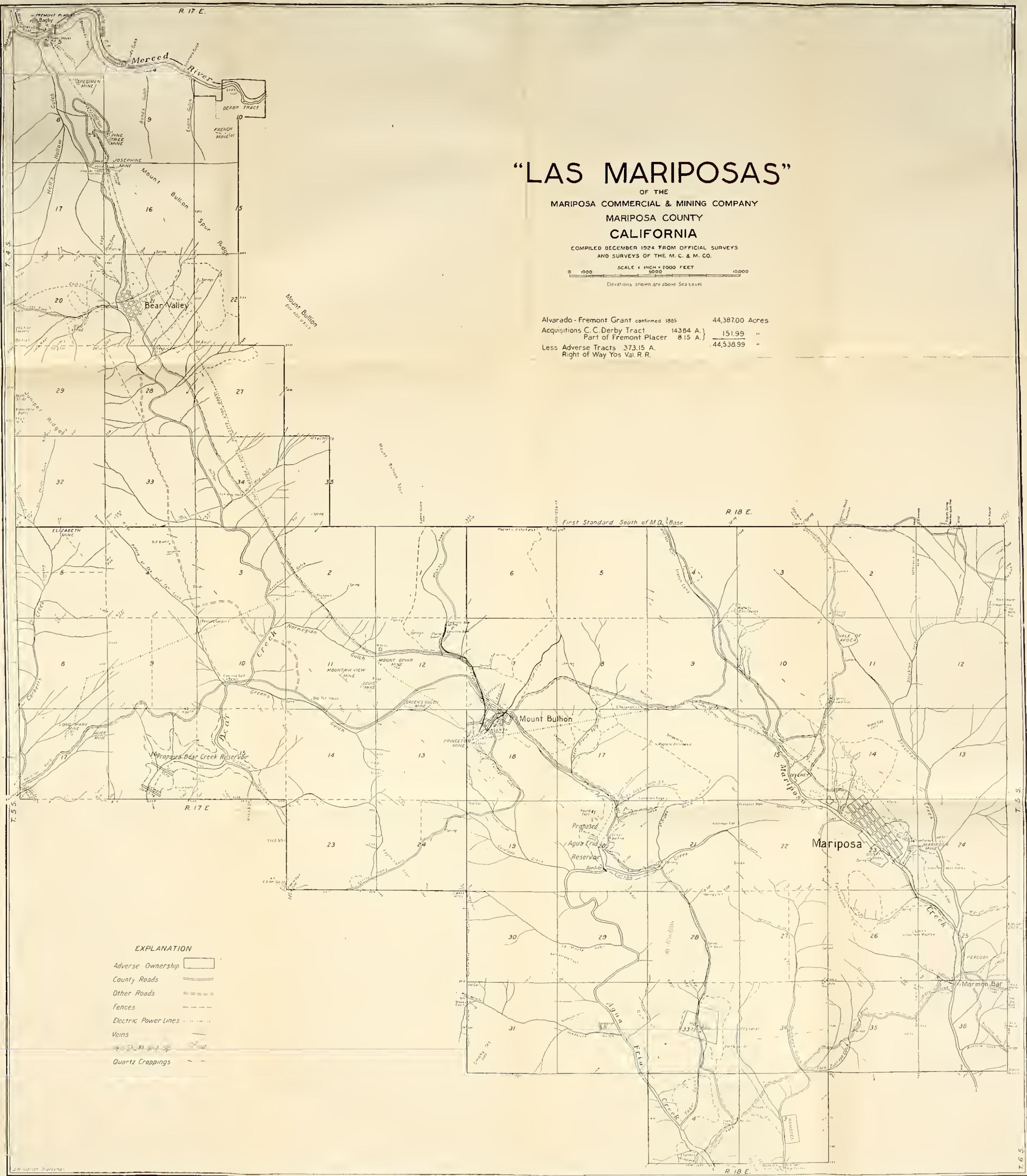
The early history of the 'Grant' is vividly described by J. Ross Brown¹ in his report to the Secretary of the Treasury in 1868. The following brief record up to 1868 is in the main extracted from Brown's report.

The grant was originally made by General Micheltorena to D. Juan B. Alvarado when California was still under the dominion of Mexico. It was purchased in 1847 by Colonel John C. Fremont, who presented his claim to the United States Land Commissioners and the patent was finally issued in February, 1856. The original grant was for ten square leagues of land suitable for grazing in the basin of Mariposa River, but the boundaries were not fixed and Fremont had the right of claiming any land within a large area. He took a long narrow strip of lowland along both sides of the river, the original map of which is in the possession of the Mariposa Commercial and Mining Company.

However, when the final survey was being made, Fremont was informed that the grant must be in compact form, and then, instead of taking grazing land, he swung his lines around and took in the Pine Tree and Josephine mines near Merced River, and other mines that had been in undisputed possession of miners, covering nearly all of the highly mineralized Mother Lode south of Merced River. As a grantee under Mexican law had no right to the minerals, it was claimed that the patent did not give the gold on the grant to Fremont. Disputes, quarrels and litigation began; the mine tunnels were barricaded, and even bloodshed followed. The trouble was finally settled in 1859 by a decision that an American patent for land carries the minerals with it, and Fremont came into complete possession of the land and mines.

A short time afterward the yield of the quartz mines of the estate became very large. The monthly production in 1860 averaged \$39,500; in 1861, \$53,500; in 1862, the year of the great flood which caused heavy damage, \$43,500; and in the first five months of 1863 it averaged \$77,000. In May, 1863, it was \$101,000, and it was at this time that the estate was sold to an incorporated company formed in New York by Fremont's creditors and capitalized for \$10,000,000. The prospectus of the company was alluring and, as the stock was put upon the market at the time of the San Francisco mining stock fever, it was readily sold. The company, instead of canceling the debt and taking stock for it, took a mortgage for \$15,000,000, payable in gold, and issued the stock subject to this and other large debts, including \$130,000 due to workmen and others in California. Everything was in confusion. The yield for the first five months of 1863, before the sale, was \$385,000, with a net profit of \$50,000 a month. During the last six months (after the sale) the output was only \$186,993, with a net loss of \$80,000 a month. In 1864 the yield was \$465,000, and the expenditures \$760,000. As a result the company soon afterward passed into the hands of a receiver.

¹ Brown, J. Ross, Mineral Resources West of the Rocky Mountains, 1868.



R. W. Raymond,¹ in his report to the Secretary of the Treasury in 1872, says, "Of the celebrated Mariposa Estate and its mines, there is nothing this year to be said. A new set of legal complications has paralyzed operations, but will terminate, it is believed, in a complete reorganization free from encumbrances."

As predicted, in 1873 the Mariposa Land and Mining Company succeeded the old Mariposa Company in the ownership of the estate. Little was done in 1874 and 1875 except intermittent driving of the long tunnel from Merced River designed to tap the Pine Tree and Josephine orebodies. After many vicissitudes during the ensuing ten years the property finally passed into the hands of the sheriff for sale. In July, 1887, the present Mariposa Commercial and Mining Company was organized by Alvinza Hayward, Flood, Hobart, Jones, Mackey, et al., who bought the 'Grant' from one Donahue, who held the sheriff's deed. The new company did practically no mining. Eleven years later, in July, 1898, the present stockholders and directors acquired control and ownership of the property through stock purchased from the original corporation.

Between 1900 and 1915 the total bullion output of the Grant mines was \$2,715,839, as shown on the tabulation herewith, most of the mining being done by lessees. There has been but little activity since 1915.

At the end of 1927 the following properties were under lease: Pine Tree and Josephine, Mariposa Mine, King Midas, Rose, Mariposa Extension and Red Bank. These are described under their respective names. The King Midas, Rose, Mariposa Extension and Red Bank are small prospects and were active. The Pine Tree and Josephine and Mariposa mines were only lately taken under lease and bond. Renewed activity at these large properties is expected in the near future.

Mariposa Grant. (See Mariposa Commercial and Mining Co.)

Mariposa Mine. This mine is one of the most important of the 'Grant' properties and was formerly one of the largest producers in the county. It was located in the early 50's and patented in 1857. The Mariposa Mine is situated at the town of Mariposa, in Sec. 23, T. 5 S., R. 18 E. The elevation is 2000 feet, topography rolling and hilly with little timber. Water is obtainable from Mariposa and Stockton creeks.

There are two veins, referred to as the North Fork and West Fork, respectively, which average 5 feet in width. Their general strike is northwest and dip from 60 to 70 degrees SW. The walls are diabase.

Mining was carried on through an incline shaft, 1550 feet deep, with eight levels. Drifts are as follows:

Level		East	West
275		390 feet	400 feet
475		400 feet	637 feet
625		700 feet	600 feet
800		322 feet	410 feet
970		396 feet	412 feet
1200		250 feet	400 feet
1400		60 feet	50 feet
1550		200 feet	130 feet

All ore has been stoped out from the 800-ft. level to the surface. Many of the underground workings are caved. The mine has not been worked since 1915 and a great deal of the equipment has been removed. A

¹ Raymond, R. W., Mineral Resources West of the Rocky Mountains, 1872.

large mill was destroyed by fire years ago. A 5-stamp mill remains on the property.

From 1900 to 1915 a total of 112,378 tons of ore were milled, having a bullion value of \$693,205, or an average value of \$6.17 a ton. Total operating costs when last operated in 1915 are reported to have been approximately \$4 a ton. Electric power was used. There was also a very large production from the mine during its early period of activity.

In 1927 the California State Highway Commission crushed the large dump at the Mariposa Mine, producing 35,000 tons of crushed rock, which is to be used for highway construction. The material is in a storage pile adjacent to the Yosemite Valley highway, one-quarter mile south of town.

Richard Jeffrey, of Briceburg, was negotiating for a lease on the Mariposa Mine in 1927, but it had not been obtained at the time of visit.

Mariposa Extension Prospect (Rovnianik). P. V. Rovnianik of Mariposa has a lease on this mine, which is one of the 'Grant' properties situated on the west side of Mariposa Creek near the town of Mariposa. He has been doing intermittent development work on this prospect and has uncovered some fairly good ore. At present additional equipment is being installed.

Mary Harrison Mine; the deepest of the four large mines owned by A. S. Bigelow and G. M. Hyans of Boston. (See *Merced Gold Mining Company*.) The Mary Harrison is in Secs. 10 and 11, T. 3 S., R. 16 E., one mile south of Coulterville. The elevation is 1900 feet, and topography rough. Water is obtainable from Maxwell and Black creeks. There are two quartz veins on the Mary Harrison, averaging about 7 feet in width, between slate walls. They strike northwest and dip 50° NE. Developments consist of a vertical shaft 1200 feet deep, with 12 levels, approximately 5000 feet of drifts; also an incline shaft 800 feet deep and many raises, crossecuts and stopes. When operated, the ore was hauled over a narrow-gauge railroad by a steam locomotive to the Potosi mill for treatment. It is said to have averaged \$7 to \$12 a ton in value. The mine was equipped with four 60-h.p. steam boilers, large steam hoist, with flat cable, compressor and other machinery, all of which were burned in August, 1926. It has been idle for 25 years or more.

Merced Gold Mining Company. Thirty years ago this was one of the largest operating companies in the county. It is now dissolved, and their former holdings are owned by Messrs. A. S. Bigelow and G. M. Hyans of Boston, Massachusetts. C. L. Mentzer, Coulterville, is local agent. These holdings comprise 26 patented claims, 7 mill sites, two 160-acre homesteads and one 160-acre timber-tract, nine miles above Coulterville. The total area is 1000 acres. The mineral land is in Secs. 3, 4, 10 and 11, T. 3 S., R. 16 E., and Secs. 32, 33, and 34, T. 2 S., R. 16 E., in the Coulterville district, near the town. The more important productive mines of this estate were the Mary Harrison, Louise, Malvina and Potosi. The ore was treated in a 40-stamp mill at the Potosi Mine, and was hauled from the other mines by a steam locomotive and train of ore-cars over $3\frac{1}{2}$ miles of narrow-gauge track. When last operated, steam power was used with wood for fuel. An electric power line now crosses the property. Some of the equipment at the various

mines remains in place, but the Potosi mill and machine shop were destroyed by fire in 1926. Surface equipment at the Mary Harrison was also burned. The deepest shaft is on the Mary Harrison, 1200 feet. Large reserves of comparatively low-grade ore are said to remain in the various mines.

Mexican Mine (El Carmen) is an old property located in Sec. 36, T. 3 S., R. 19 E., in the Hite Cove district, six miles north of Jerseydale; owned by Frank H. Catherwood, Jerseydale. The elevation is 3500 to 4000 feet, topography rugged. There is not much timber and water is scarce at the mine except in winter. Two quartz veins, from 2 to 6 feet in width, with slate walls striking northwest and dipping about 80°, have been developed by an incline shaft 150 feet deep and a total of 625 feet of drifts. The ore is 'ribbon rock' and carries free gold. The property has been idle in recent years and there is no equipment on it.

Mocking Bird Mine consists of one claim, patented in 1904 and owned by J. A. and C. J. Schroeder of Mariposa. The Mocking Bird Mine is on an extension of the Colorado vein, and is situated in Sec. 27, T. 4 S., R. 18 E., in the Colorado district, about six miles north of Mariposa by road. Elevation, 2700 feet; plenty of timber and sufficient water for milling from springs. The vein averages 3 feet in width and is on a contact between a porphyry footwall and slate hanging wall. It strikes northwest and stands nearly vertical. The ore is free-milling. The vein is intersected by a talcose-porphyry dike, which appears to have robbed the quartz vein of values. There is a 100-ft. shaft with drifts and a tunnel 500 feet long. The mine was last worked under lease by Weston Brothers, who took out considerable ore; not active recently.

Mountain Belle Group. This property includes three mining claims: the Dorothy (Artru Mine, which see), White Oak and Blue Quartz, together with 160 acres of patented land containing several veins (Hayes property) and mining rights on 80 acres of patented land (McMillan property; also called Champion Mine) now grouped under the name Mountain Belle, and owned by Belle McCord Roberts, Long Beach, California. These holdings are situated in the Colorado district, about seven miles north of Mariposa in T. 4 S., R. 18 E. Elevation from 2500 to 3000 feet. There is ample timber, but water is rather scarce except in winter. The following notes regarding the holdings are excerpts from a report made for the owner by Walter Techow, Sacramento:

"A strong vein passes through the whole length of the White Oak and Blue Quartz claims and has been opened up at several places on the surface. It has a general north-south course and width of two to three feet. An old shaft on the vein is now caved. Two samples from the dump, the first clean iron-stained quartz and the second an average of the whole dump and containing surface dirt, assayed \$46.40 and \$7.20 in gold, respectively. Both walls are diorite. Another vein, locally called the Champion, passes through the patented land and can be traced for 4000 to 5000 feet. Its course is east-west and it probably intersects the White Oak vein. The Champion vein is from eight to twelve feet wide and has been opened up by a shaft, now caved, near the center of the group. The size of the dump indicates a great deal of work was done through it. Several arrastras were at work here in former days. An average sample of the dump assayed \$7.50 a ton. The Champion vein occurs in slate and its eastern end is crossed by a soft porphyritic dike similar to the highly productive one on the Artru claim. This dike has been placed to some extent, but it is evident that only a little water was available for placer operations. The Champion vein is very persistent and uniform. The slate belt in which it occurs is narrow and in places the vein appears to be in contact between slate and granite. Electric power is only a few miles distant."

Mountain Belle Mine; one patented claim in Sec. 25, T. 5 S., R. 17 E., six miles west of Mariposa in the Guadalupe district. There is one vein, 3 feet in width. The strike is northwest and both ends of the vein run onto the Mariposa Grant property; dip, 30° SW. There is an incline shaft 174 feet deep, with two levels and about 100 feet of drifts. There was a 5-stamp mill on the mine and the ore is said to have run \$21 a ton. Idle since 1908. Last known owner, J. D. Crichton, San Francisco.

Mountain King Mine. This has been one of the more important producing properties situated outside the 'Grant.' It was active almost continuously for 20 years, closing down in 1922. It is owned by the Mountain King Mining Company, 314 Kohl Building, San Francisco; at present in course of dissolution. The property consists of a group of 18 patented claims having an area of 348 acres, located at Mountain King in Sec. 31, T. 3 S., R. 18 E., and Sec. 6, T. 4 S., R. 18 E., on the Yosemite Valley Railroad and Merced River, six miles east of Bagby.

There are four veins which average 5 feet in width between slate walls. Their strike is northwest and dip 65° NE. The mine was developed to a depth of 2200 feet, there being a total of four or five miles of underground workings. For the most part the ore was low-grade, running from \$4.50 to \$5 a ton.

The property was equipped with a complete 30-stamp mill, sawmill, hoist, and compressor, all operated electrically, and an electric locomotive for hauling ore from the mine to the mill. The company also owned their own hydro-electric power plant situated on the river about one mile below the mine, which supplied all power used.

When operations ceased in 1922, due mainly to increasing costs with deep development bringing profits to the vanishing point, the power plant was sold to the San Joaquin Light and Power Company and all other equipment sold and removed except a cottage or two for accommodation of the watchman.

Mountain View Mine, another of the 'Mariposa Grant' properties, is located near the Louis Mine in Sec. 11, T. 5 S., R. 17 E., about two miles northwest of Mt. Bullion. The elevation is 2155 feet; surface rough with no timber and very little water available. There is one vein, averaging 2½ feet thick with slate walls. Strike northwest and dip about 60° NE. There are two adit levels with over 1000 feet of drifts and crosscuts, also a number of raises and stopes. From 1910 to 1920 the mine was worked quite regularly by lessees, the ore being milled in the Princeton mill. The ore taken out was fairly high-grade, averaging from \$40 to \$50 a ton with some lots as high as \$90. It has not been worked recently, and is now standing idle.

Mount Buckingham Group consists of eight quartz claims and 169 acres of patented timber land, a total of 339 acres. The claims were first located in 1850 by Wm. Buckingham. The property is now owned by Jas. L. Diven, 147 Kempton avenue, Oakland. It is situated in Secs. 1, 2, 11 and 12, T. 5 S., R. 19 E., about ten miles a little north of east from Mariposa. The topography is very rugged, the elevation being 4600 feet. Good timber and water are available.

There are five veins, called the Vanderbilt, Golden Slipper, Crown Point, Apex and Sunnyside. Their general strike is northwest and they dip southwest from 70° to 85° . Widths vary from 10 to 12 feet. This is considered to be a large low-grade property, the veins being reported to assay from \$4 to \$15, and there has been considerable development, including a 500-ft. crossecut tunnel, a 250-ft. raise and a number of winzes and stopes. There was a 10-stamp mill on it in early days, but this was destroyed by fire years ago. In 1927 some work was done, about 200 feet of drift being run on one of the veins, but as the ore developed only ran \$3 a ton and did not pay, the work was stopped. Idle.

Mount Ophir Mine. This is another Mother Lode mine on the 'Mariposa Grant,' owned by the Mariposa Commercial and Mining Company. It is located in Sec. 12, T. 5 S., R. 17 E., about one mile northwest of the town of Mt. Bullion. The elevation is 1900 feet, the surface rough with no timber and very little water. There is one vein, averaging 5 feet in width between a serpentine footwall and slate hanging wall. It strikes northwest and dips 55° NE.

The development work consists of three adit levels with a total of 1500 feet of drifts, 360 feet of raises, an 80-ft. crossecut, 20-ft. winze and stope 5 feet wide, 200 feet long and 300 feet high. There is no reduction equipment. A power line crosses the property.

This mine was opened in the early 50's and the ruins of what is said to be the first mint in California may still be seen here. Fifty-dollar gold slugs were minted. The mine was closed by the company in 1900. Between 1900 and 1913, inclusive, various lessees took out approximately 2400 tons of ore which averaged \$12.37 a ton. Idle since 1914.

Mt. Gains Mine. This is one of the larger mining properties in the Hornitos district. From a distance it has a prosperous appearance with its 20-stamp mill and numerous buildings, blacksmith shop, store house, office, cookhouse, two bunk houses, assay office, eleven cottages and cabins, all painted red, large gallows frame and mine dumps, but it has been idle since 1910. The Mt. Gains property includes a group of 15 claims, 200 acres of patented land and 160 acres of mineral rights. It is in Sec. 35, T. 4 S., R. 16 E., seven miles northeast of Hornitos, or 14 miles from Merced Falls on the Yosemite Valley Railroad; address, Mt. Gains Mining and Milling Company, care of Glenn C. Williams, Route 1, Box 291, Bellflower, California. The surface consists of low rolling hills, the elevation at the mine being only 1100 feet. There is no timber. Water can be obtained from the mine and springs.

There are extensive underground workings, consisting of a shaft, 1350 feet deep, with 11 levels; a total of 7840 feet of drifts and several stopes, 5 feet wide and from 400 to 500 feet high. The vein is from 4 to 30 feet in width between a granite footwall and schist hanging wall. Its strike is northeast and dip 30° SE. The ore occurs in kidneys and lenticular bodies.

The mill had a capacity of 85 to 100 tons a day, and the average value of the ore milled is reported to have been around \$8 a ton, the concentrates running \$150 a ton. Electric power was brought in from Merced Falls. The shaft is down a considerable distance below the

lowest level worked and it is claimed the vein showed up strongly all the way. The operating company got into debt in 1910, the mine was closed down and later sold at sheriff's sale. It was unwatered in 1917, but no production was made. Idle, and reported still in litigation.

North Star and Oro Grande Claims. These claims are situated in Sec. 32, T. 4 S., R. 18 E., in the Whitlock district. They are about one mile south of the Spread Eagle Group, and four miles by road north of Mariposa. Owner, Belle McCord Roberts, Long Beach, California. The claims are traversed by a quartz vein, which strikes north and dips easterly at a flat angle. The walls are porphyry. Former owners opened up the vein to a shallow depth by a crosscut tunnel 150 feet in length. It is narrow where cut, but shows up 3 to 4 feet wide on the surface at other points. There has been no development except one stope near the crosscut and a few shallow surface cuts. These claims adjoin the old Whitlock Mine which was worked to a depth of about 1000 feet, and the North Star-Oro Grande vein intersects the Whitlock vein at a depth of 800 feet on the Whitlock property, where much good ore was reported taken out. Electric power is now available within a short distance. Samples taken by Walter Techow of Sacramento are reported to assay as follows:

North Star-Oro Grande:				
6 inches of quartz at tunnel	-----	Gold	\$50	40 a ton
10 inches both faces of stope, average	-----	Gold	29	60 a ton
3 feet of vein on surface	-----	Gold	4	80 a ton
Vein south of crosscut on surface	-----	Gold	4	12 a ton

Number Five Mine comprises two full claims and two fractional claims, having a total area of 60 acres. Owner, Number Five Mining Company; J. J. Le Tourneau, secretary-treasurer, 2643 Hillegass avenue, Berkeley, California. The property is in Sec. 10, T. 5 S., R. 16 E., about five miles northeast of Hornitos. The surface is composed of low rolling hills, barren of timber. Elevation, 1400 feet. Water is obtained from springs. There are two quartz veins which have a diorite footwall and schist hanging wall. The strike is northeast and dip 45° NW. Opened up by a shaft 260 feet deep with three levels and 110 feet of drifts. The mine is equipped with a ball mill and amalgamation plates, electric hoist, compressor, machine drill, boarding house, assay office and several other small buildings. Electricity was furnished by the San Joaquin Light and Power Company. The Number Five Mining Company acquired the property in 1914 and worked it for some time. It was active at intervals until 1922. Idle at present.

Number Nine Mine. This property comprises 403 acres of patented land in Sec. 10, T. 5 S., R. 16 E., located about three miles northeast of Hornitos. Owner, Number Nine Gold Mining Company; L. A. Ginaca, president; home office, 1237 Twenty-third avenue, Oakland; B. S. McArthur, mine superintendent. The mine was formerly owned by the Mose Rogers Estate of San Francisco, and the property was in litigation for a number of years prior to 1924, at which time the lawsuits were finally settled. Since then the company has been carrying on development work, consisting mainly of cleaning out and retimbering all workings and shafts. There are four shafts, the Keys vertical shaft, 140' deep, and three incline shafts, No. 9 shaft, No. 5

shaft and Josie shaft; the deepest, No. 5, being 600' on the incline. Sinking, drifting and crossecutting is being carried on at this shaft. Twelve veins in all have been encountered. These exhibit considerable variation in both strike and dip, there being apparently two series of veins, one of very flat dip, 20° to 28° , and another series of nearly vertical cross veins, showing the area to have been one of great disturbance. Diorite occurs on the footwall and thinly laminated schist or slate and porphyry on the hanging wall. The general trend of most of the veins is northwest and all of the flat series of veins dip east. One lode or vein in No. 9 shaft is said to be 40 feet wide and mineralized the full width. The other veins are comparatively narrow. The ore is a heavy sulphide, the principal value being in gold. A recent shipment of selected ore was made to Selby smelter.



Key shaft and mill at Number Nine Gold Mine, near Hornitos,
Mariposa County.

The mill contains two 10-stamp Straub mills and two concentrators, a Wilfley and a Deister. There is a 2-cylinder Union gas engine hoist, two 6" by 7" I.-R. compressors, shop, boarding house, assay office, dwellings and office building. The company proposes to install electric power in the near future. Eight men are employed underground.

Number One Mine comprises one full claim, first located about 1875. It is situated in Secs. 34 and 35, T. 4 S., R. 16 E., about five miles northeast of Hornitos. Owner, *Treasure Gold Mining Company*, address uncertain. There is one quartz vein about three feet in width with a slate footwall and diabase and porphyry hanging wall. It strikes northwest and dips 43° southwest. Development consists of a shaft 360 feet deep with three levels, about 1200 feet of drifts and several large stopes. The mine was equipped with a 10-stamp mill operated by electric power, electric hoist, assay office, bunk house and other buildings. It was last operated in 1914-15. Since then the mill has burned down. Idle.

Oaks and Reese Mine. This mine was famous in the early mining history of Mariposa County, as it was at one time a very large producer. From 1868 to 1870 it is credited with a production of \$30,000 a month. A lawsuit over water rights and the reaching of the limits of a rich shoot they had been working caused the shut-down many years ago. The Oaks and Reese is located in Hunter Valley in Sec. 32, T. 3 S., R. 16 E., about 14 miles north of Hornitos. It consists of two patented claims, the Grand Prise and Badger, owned by Oaks and Reese Mining Company, controlled by New York people.

There is an incline shaft 450 feet deep and about 800 feet of drifts. The shaft is located at the junction of the main or 'blue lead' with a cross vein known as the 'Potts.' The main vein is about four feet wide and the latter 18 inches. About 400 feet south of the shaft another vein, the 'Floyd,' joins the main vein. The 'Floyd' is 15 inches in width. The main vein strikes northwest and dips about 80° northeast. Chert forms the hanging wall and porphyrite the footwall. Most of the work was done on the 'Potts' vein, there being very little development on the main vein. Both the 'Potts' and 'Floyd' veins are said to be rich and it is claimed the run of mine ore will average around \$10 a ton. The old 28-stamp mill used in early days has long since been removed. A hoist and gallows frame remains on the ground. The shaft has been retimbered since the shut-down.

Odell Mining and Milling Corporation. This is a California corporation organized in March, 1927, with a capital stock of \$250,000; George A. Odell, president; W. E. Condon, secretary-treasurer; address, 1109 Ingraham street, Los Angeles.

The company owns the Odell Group of 6 unpatented claims, situated near the confluence of Sherlock Creek and Merced River, in Sec. 14, T. 4 S., R 17 E., on what is known as Telegraph Hill. The discovery on which the corporation is based was made in November, 1924, since which time two adits have been driven. The upper adit is 80 feet in length and cut two veins at 35 and 70 feet, respectively. The first vein is about 18 inches in width and carries free gold with some 'specimen' rock. The other vein is a contact vein about 3 feet in width near a diabase intrusion. It has been drifted on 70 feet and is said to show good milling values. A lower crosscut adit, 175 feet in length, intersected the veins at 55 feet and 135 feet from the portal. An intersecting vein cutting the formation almost at right angle was developed in this working. A road to the property, which is about 1500 feet above the level of Merced River, is being constructed. This property was not visited. A detailed report by Bedford and Hind, mining engineers of Los Angeles, may be seen at the company's office.

Onyx Mine consists of one mining claim and patented land surrounding it in Sec. 10, T. 6 S., R. 17 E., owned by L. H. Rowland and S. B. Givens of Cathay. There is a quartz vein 3 feet in width striking northwest and dipping slightly to the southwest. The quartz contains free gold and sulphides. The vein, which can be traced for a mile and a half, is opened up by a shaft 60 feet deep. Property is one and one-half miles from Yosemite highway and readily accessible. There is electric power within six miles and timber and water are available.

Original Mine. This gold mine is a good example of a well-managed, regularly producing and good dividend-paying mine: in fact, at the present writing it is the only metal mine in Mariposa County of which the above can be said. It is owned by Original Mining and Milling Company; H. W. Banks, president; C. E. Koher, secretary and treasurer; G. M. Egenhoff, manager, and J. W. Warford, mine superintendent; home office, Merced; mine address, Clearing House. The company was incorporated in 1911, with a capital of \$200,000, and except for a few very short interruptions, it has operated continuously since 1911. The company's stock is held closely and little publicity has been given to their operations.

The Original Mine is located at Clearing House on Merced River and Yosemite Valley Railroad, about six miles west of El Portal, in Sec. 21, T. 3 S., R. 19 E. Elevation at the railroad is 1500 feet, but the surface is rugged and rises steeply toward the north. There is very little timber. Water is obtained from the river.



Original Mining and Milling Company's property, showing mill in left foreground.
Clearing House, Mariposa County.

The property consists of ten claims, all patented. The four original claims were located in 1908 and the others acquired later, some by purchase. There is one vein averaging 2 feet in width, but having a maximum width of 6 to 10 feet in places on the lower levels. Hoisting is through a two-compartment inclined shaft, 1100 feet in depth with ten levels. There are 670' of drifts on the first level, 1200' on the second, 1300' on the third, 1250' on the fourth, 660' on the fifth, 1700' on the 650-ft. level, 1200' on the 750-ft. level, 700' on the 850-level, 1600' on the 950-level and 1300' on the 1100-level; also one crosscut of 1300' and 1000' of raises and many stopes. The crosscut taps the Ferguson vein (Anderson Mine) now a part of the Original Company's holdings.

The Original vein strikes northwest and dips 75° NE.* In the lower levels the shaft is in the hanging wall. Two faults were encoun-

tered on the 950- and 1100-ft. levels, which cut off the vein for a distance of 110', but it was picked up again on the lowest level where it was 6 to 10 feet wide. Four ore-shoots have been developed, the longest 100' to 125' in length and the others 50' to 75'; all pitch to the north at about 45°. At present a winze is being sunk in the vein from the 1100-ft. level, 150' north of the shaft. Very little timber is required, as the ground stands well. The mine makes only a little water.

The country rock is mainly Calaveras slate, but the Calaveras formations are intruded here by granite, and although no granite appears on the surface the vein runs from the slate into granite, crossing the contact without interruption, and in the lower levels both walls are granite. The ore is a dark, free-milling quartz carrying about 2% sulphides.

Equipment includes a 30-h.p. electric hoist and a 12" by 18" I.-R. compressor. Besides the mill, there is an office, boarding and lodging houses, superintendent's house, several cottages, blacksmith shop, assay office and a power house. Power is supplied by the San Joaquin Light and Power Company. The local plant, which is operated by water-power brought through a 1900-ft. flume capable of carrying 6000", being held for emergency use, or if water is available, for operating the compressor.

There is a 10-stamp mill, with Blake crusher, Challenge feeders, two 4' by 16' plates and one Deister and one Overstrom concentrating table. The ore is crushed to 40-mesh in the batteries, from 30 to 35 tons per day being handled. Concentrates are shipped to a smelter.

The following excerpts are taken from the annual report of the company's operations for the year ending December 31, 1926:

Development

Development work in 1926 was directed principally to the lateral exploration of the vein at the 950 and 1100 levels.

At the beginning of the year 1100 north drift had passed through No. 1 orebody and was about to enter No. 2 orebody, which joined the former. The drift was extended 422 feet to a point 712 feet from the station crosscut, where the work was suspended to allow necessary raising and stoping operations to proceed. Drifting at this level disclosed a continuous body of ore 507 feet in length. This body, which ranges in width from one foot to eight feet, represents a consolidation at this horizon of the first three orebodies. Drifting will be resumed as soon as possible in order that the orebodies to the north may be opened.

A little work was done south of the 1100 station crosscut. The south drift was driven 18 feet. A narrow vein of quartz carrying a little value is exposed here.

Early in April drifting operations were resumed at the 950 level. 950 north drift was advanced 617½ feet to the present face, 1363 feet in. An interesting feature of this development was the appearance at 857 feet of an orebody which proved to have a stoping length of 156 feet. This orebody represents the downward projection of a short and narrow lens of quartz which, in 1922, was encountered in 750 north drift at 855 feet. The 950 drift is now being extended in to open the fifth orebody. It is expected that this oreshoot will be encountered very shortly.

In August new exploration was undertaken in 650 north drift. The drift was advanced from 1365 feet to 1518 feet from the station crosscut, a distance of 153 feet. Although no ore was encountered in this distance, conditions appear favorable for the occurrence of another orebody. It is planned to explore the vein further when circumstances permit.

Mining

During the year stoping of ore was in progress at the 750, 850, 950, and 1100 levels. The following tonnages of ore were hoisted:

Level	Tons	Per cent of total tonnage
750-----	2,825	24.3
850-----	3,008	25.9
950-----	3,530	30.5
1,100-----	2,248	19.3
	11,611	100.0

During the same period 3718 tons of waste was removed from the mine. This tonnage was produced principally in drifting and crosscutting operations. A considerable part, however, was sorted out from ore drawn from stopes.

At the close of 1926 the reserves of broken ore were somewhat lower than a year ago. Broken ore in stopes and raises on January 1, 1927, amounted to 6675 tons, which represents a decrease of 1693 tons from that on hand January 1, 1926.

The tonnage of ore in place (exclusive of broken ore reserves) is slightly less than on January 1, 1926. It is estimated that there is 14,435 tons of standing ore in the mine. Considerable additions will be made to this total during the coming year as the various orebodies are opened at the 950 and 1100 levels.

Milling

During 1926 the mill crushed 10,734 tons of ore, the average head value of which was \$17.12 per ton. Some slight loss of operating time resulted from shut-downs caused by blasting on the highway. Except for this, the mill operated at maximum capacity throughout the year.

1550 tons of waste was sorted at the surface from ore going to mill.

Bullion obtained by amalgamation amounted to 9583.64 ounces troy.

Concentrates saved amounted to 55.26 tons, the metal content of which was

Gold	262.56 oz.
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Silver	278.94 oz.
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which represents an average value of \$101.15 per ton.

The aggregate gross value of bullion and concentrates was \$164,327.38. The net proceeds from the sales of both products totaled \$162,411.88, the difference consisting of refining charges on bullion and smelter and freight charges on concentrates.

The average value (gross) recovered per ton of ore milled amounted to \$15.30, the net return from which was \$15.13.

The following summary, containing comparative data on production for the past three years, will be of interest:

	1924	1925	1926
Ore mined, tons	1	11,650	12,901
Broken ore in reserve, tons	11,101	8,368	6,675
Developed ore, tons	18,472	17,207	14,435
Ore milled, tons	10,351	11,094	10,734
Concentrates obtained, tons	41.19	37.495	55.26
Concentrates, value per ton	\$118.21	\$130.90	\$101.15
Production, gross value	\$150,872.41	\$167,642.68	\$164,327.38
Production, net value	\$149,809.39	\$165,499.16	\$162,411.88
Value recovered per ton of ore milled	\$14.58	\$15.11	\$15.30

Value recovered, per ton (8-year average), \$13.81.

Oro Rica Mine (Pinon Blanco). This property consists of the Pinon Blanco, North Pinon Blanco, Old Judge, South Judge, Little Judge and mill site, patented claims, having an area of 95 acres, and the Star lode claim and Stephen placer unpatented claims, owned by the Oro Rica Mines Company, care of A. E. Towers, Metropolitan Club, New York. The mine is in Secs. 19, 20 and 29, T. 2 S., R. 16 E., about three miles north of Coulterville, near the northern boundary of the county. There are two contact veins, varying from three to six feet in width, between a slate footwall and diorite hanging wall. The strike is N. 20° W. and dip 65° NE. The outcrop of the vein and workings on the top of Pinon Blanco Ridge form a conspicuous landmark. The property is developed by a tunnel over 2000 feet long, with 900 feet driven on the vein. It is equipped with a 20-stamp mill, but litigation over ownership has resulted in the mine being idle for the past ten years.

Our Chance Mine consists of one claim, located in early days. It is situated in the Whitlock district in Sec. 29, T. 4 S., R. 18 E., about seven miles northwest of Mariposa. Owned by Albert Austin, of Mt. Bullion, who has held it about 20 years, during which time it is said to have produced \$40,000. It has been worked as a pocket mine and has produced some beautiful gold specimens and also quartz crystals of good grade. There is said to be some milling rock on one end of the claim. The vein varies from 4 inches to 3 feet in width at the deepest part and contains considerable ribbon quartz. Development consists of a tunnel, 150 feet long, with several drifts, and a 70-ft. winze. A second tunnel is 75 feet long and has a 60-ft. winze. It has been worked by hand and the gold recovered in a mortar or by arrastra. The owner

has been harassed by stock-raising homestead claimants in recent years and wants to sell.

Permit Mine (Bull Dog) consists of the Boulder and Permit claims, the former in Sec. 23, and the latter in Sec. 31, T. 4 S., R. 18 E., in the Whitlock district, six miles northwest of Mariposa. Owner, Theo. E. Kockel, Mariposa, California. It is best reached by trail from Bear Valley. Most of the development consists of a shaft put down on the Permit claim in the course of doing annual assessment work. There is a vein here from 2 to 4 feet wide between porphyry walls. The ore is said to assay \$30 a ton.

Pine Cone Mine (Bald Mountain). This property consists of one claim, situated in the Quartzburg district, seven miles northeast of Hornitos in T. 4 S., R. 16 E. The claim contains two quartz veins, one 6 inches to $1\frac{1}{2}$ feet wide and the other varying from 1 to 2 feet in width. These unite and form a single vein about $2\frac{1}{2}$ feet wide. It was first worked about 45 years ago. There has been considerable production from pockets, but nothing except assessment work has been done recently. Owner, F. A. Cavagnaro, Hornitos.

Pine Tree Mine is one of the 'Mariposa Grant' properties located midway between Bear Valley and Bagby in Sec. 9, T. 4 S., R. 17 E. The Pine Tree was one of the large producers in the early history of mining on the 'Grant.' It adjoins the Josephine, another famous producer, and they are usually worked as one mine. The elevation is 2070 feet, topography rough and sparsely timbered. The vein here averages ten feet in width; it strikes northwest and dips 55° NE. The footwall is slate with serpentine on the hanging wall. Development consists of a tunnel and 380-ft. shaft with approximately 5000 feet of drifts on four levels. When formerly operated on company account, the ore was milled in the Benton mill on Merced River at Bagby, also belonging to the company. More recently the Pine Tree and Josephine mines have been worked by lessees and the ore milled in the Princeton mill at Mt. Bullion. The total combined output from 1900 to October 31, 1915, was 29,968 tons, having a value of \$371,749, an average of \$12.40 a ton. There has been but little activity since 1915. However, in 1927 a lease on this mine and the adjoining Josephine was given to Thos. H. Lipps, 206 Financial Center Building, Los Angeles, president of the *Vallecito Mining Company*. The latter company is operating a rich gravel deposit in Calaveras County, and it is reported that this company will soon start work on the Mariposa properties.

Potosi Mine; owned by A. S. Bigelow and G. M. Hyans of Boston. (See under *Merced Gold Mining Company*.) The Potosi is situated $1\frac{1}{2}$ miles west of Coulterville, in Sec. 4, T. 3 S., R. 16 E. The elevation is 1700 feet, surface fairly rough and with little timber. Water was obtained from the mine. There is one quartz vein, varying from 1 to 20 feet in thickness, between slate walls. It strikes northwest and dips 49° northeast. It was developed by a tunnel, 2500 feet long on the vein, an incline shaft, 350 feet deep, two air shafts, crosscuts, raises and stopes. The mine was partly unwatered in 1912 except for which there has been nothing done for many years. The 40-stamp mill and other surface equipment was destroyed by fire in 1926.

Princeton Mine. The Princeton is one of the most famous mines of the 'Mariposa Grant.' Owned by the Mariposa Commercial and Mining Company; E. H. Benjamin, president, 308 Finance Building, 580 Market street, San Francisco. The mine is located at Mt. Bullion, in Sec. 18, T. 5 S., R. 18 E. It was first worked in 1852. Writing in 1868, J. Ross Brown in his report to the Secretary of the Treasury¹ says, "The Princeton Mine has been one of the most productive in California, and has been noted for both the abundance and richness of its quartz. For a time it yielded \$90,000 a month from milling rock, and this is more than any other mine of the state ever did. * * * The richest rock was found within 100 feet of the surface, where the pay was \$70 a ton from milling rock, besides large numbers of specimens, of which it is said that not less than \$100,000 in value were stolen by the miners."

There was an incline shaft 1660 feet deep with eight levels and a total of 11,418 feet of drifts previous to late operations by the Princeton Gold Mines Company, and the ore had been stoped from the 1200-ft. level to the surface.

From 1900 to October 31, 1915, the Princeton yielded \$1,228,273.56 from 350,329.37 tons of ore, giving an average value of \$3.50 a ton. The vein which was worked averaged eight feet in width between slate walls. It strikes N. 35° W. and dips between 45° and 60° NE. The property was completely equipped and had a 40-stamp mill, all operated by electric power. Total cost of operating in 1914 was \$2.71 a ton. In 1915 operations ceased and the mine remained idle until 1921.

Princeton Gold Mines Company Trust Estate Mines. In 1921 Theo. E. Kelso and Wm. H. Holmes contracted to purchase the Princeton Mine and a considerable acreage of 'Grant' land from the Mariposa Commercial and Mining Company. They later dropped the land purchase, but retained the Princeton Mine, giving a mortgage back to the 'Grant' owners as security. Holmes and his associates organized the *Princeton Gold Mines Company* and carried on an intensive stock-selling campaign, mainly throughout the eastern states. Work was begun at the mine. The 40-stamp mill was dismantled and parts used in rebuilding a 20-stamp mill on another site. Intermittent mining was carried on until 1926. While under their control the main shaft was sunk 670 feet and a drift was run west 800 feet at the 150-foot level on a vein which they supposed was the Princeton vein, but this is seriously questioned by those long familiar with the ground. Ore in this drift averaged \$3 a ton. No drifting was done below the 300-foot level. Judging from results attained, these promoters appear much more adept at stock-selling than mining, the belief being current that stock sales netted several hundred thousand dollars and that the effective work accomplished at the mine could have been done for one-tenth of that amount. Apparently only enough was done to keep up appearances. The management was changed frequently, stock given for miners' wages, interest and payments were allowed to become delinquent, and finally in 1926 all work stopped except pumping. In the summer of 1927 a forest fire swept over the property and the mill

¹ Brown, J. Ross, Mineral Resources West of the Rocky Mountains, 1868.

was burned. This precipitated the end. The pumps were shut down and the mine is now filling with water. A foreclosure suit brought by the Mariposa Commercial and Mining Company in 1927 resulted in title to the mine reverting to the 'Grant' owners. Idle.

Prothero Brothers Mine was composed of eight unpatented claims owned in 1920 by Prothero Brothers and Belknap Brothers of Orange Grove, California. The claims were located in Sec. 3, T. 6 S., R. 19 E., on the West Fork of Chochilla River. The country rock is granite. Some work was done on them for several years, and in 1922 they were under option to Orlando Moore, Route B, Visalia. The claims were later abandoned, after several tunnels had been run in an endeavor to develop an orebody. The equipment, which consisted of a 60-h.p. gas engine and compressor, has been removed.

Quail Mine (Mammoth or Sunset) includes the Bull Dog, Bonanza Bug, Mammoth, Bonanza, Jumper, Sunset, Columbia and Eureka claims and 200 acres of timber land, located in Sec. 16, T. 3 S., R. 17 E., about eight miles southeast of Coulterville on Indian Gulch, which opens into North Fork Merced River. Owner, Frank J. Bruschi, Coulterville.

The topography in this area is rugged, the elevation at the mine being 2300 feet. There is plenty of water from springs, mine and in the gulch.

There are three veins which average 4 feet in width between a porphyry footwall and slate hanging wall. They strike northwest and dip 40° SE. The Quail Mine has been worked intermittently over a long period of years by the owner and various lessees. It was equipped with a 10-stamp mill, but this was destroyed by fire in 1917. In the latter part of 1919 it was being developed by M. A. Elftman, who was operating a Gibson mill.

The workings consist of a tunnel about 1000 feet long, one shaft 150 feet deep, another incline shaft 55 feet in depth and several stopes and raises. A total depth of 700 feet has been reached in the workings and there is said to be 30 inches of \$14 ore on that level. It is idle at present.

Queen Specimen Mine. A 'Grant' property situated in Sec. 8, T. 4 S., R. 17 E., about one mile northwest of the Pine Tree and Josephine mines. The elevation is 1423 feet. The vein strikes northwest and dips northeast.

This mine was worked a little in 1925 by Wm. Deaner and others who had it under lease. About 500 tons of ore was milled. It is included in the lease covering the Josephine and Pine Tree mines recently granted to the *Vallecito Mining Company*. Idle at present.

Recorder Mine consists of the Recorder, Rex and Cherry Tree claims, located in the Colorado district in Sec. 20, T. 4 S., R. 18 E. Owner, Robert MacLean, Mariposa. Elevation, 2400 feet; surface rough with some timber. There is plenty of water from springs and from the mine. There is a quartz vein averaging 1 foot in width, between porphyry walls, which is worked intermittently as a pocket and placer mine. The vein strikes north and dips about 70° E. It is developed by an adit level and several hundred feet of drifts. (See Rex Mine, also.)

Red Bank Mine. One of the several properties above the north bank of Merced River northwest of Bagby. The Red Bank is in Sec. 36, T. 3 S., R. 16 E. Country rock is slate, mariposite and serpentine. The property is patented and consists of the Merced Placer, Stevenson, Daisy, Jubilee, Syndicate lode and Coolgardie placer claim, comprising 165 acres, 90 acres placer and 75 acres lode. The owner is Percy L. Pettigrew, 1227 Flood Building, San Francisco. It has been idle for a long time.

Red Bank Prospect is a pocket mine on the Mariposa Grant at Mt. Bullion. It is under lease to and is worked by Louis Marre of Mt. Bullion.

Red Cloud Mine. This is an old mine said to have had a production record of \$1,500,000. It has not been worked for thirty years. It is located in Sec. 22, T. 2 S., R. 17 E., about nine miles east of Coulterville. The last known owner is Mrs. Emma McDiarmid of Coulterville. There is one vein from 1 to 3 feet in width between slate walls; strike east and dip 60° N. It has an incline shaft and 500 feet of drifts. Idle.

Red Oak Mine is a single claim, situated in Sec. 35, T. 3 S., R 16 E., two miles in an air-line west of Bagby. Elevation, 2000 feet. The location, which has been held by the present owner, J. E. Taylor of Bagby, for the past four years, is based on an early-day discovery. There is a quartz vein 2 to 3 feet wide, on which pan tests show good free gold prospects. It is developed by an open cut and tunnel 35 feet in length. There is a little timber on the claim and plenty of water from springs. Equipped only with hand tools, the owner working alone.

Revel Mine consists of one claim located at Sweetwater in Sec. 28, T. 4 S., R. 19 E. There are several veins about 2 feet in width, with granite walls. They strike east-west and stand nearly vertical. Development consists of a shaft 150 feet deep, several hundred feet of drifts and a stope 800 feet long and 150 feet high. Idle for years and the workings are badly caved.

Rex Mine (Rumley). (See also Recorder Mine.) The Rex claim is a relocation made in 1921 of the old Rumley and is a pocket mine. Owner, Robert MacLean, Mariposa. Occasional pockets have been taken out from the Rumley vein through a 52-foot incline shaft and drifts. The vein strikes north and is quite flat, dipping 30° E. It varies from 4 inches to a maximum of 18 inches in width. During 1927, in running a crosscut easterly to cut this vein below the bottom of the incline shaft, MacLean cut another flat vein which does not outcrop, varying from 2 inches to 2 feet in width, and dipping in the opposite direction, west; or this may be the Rumley vein broken over. In March, 1928, a short drift on this vein ran into a very rich streak and for a time the owner was pounding out \$200 a day with a hand mortar.

Roma Mine consists of one patented lode claim and mill site containing 25 acres, located in Sec. 14, T. 4 S., R. 18 E., adjacent to the Yosemite Valley highway and about two miles south of Briceburg. Owners, M. A. and Frank H. Harris, Fifth and Brannan streets, San Francisco. Elevation, 2700 feet; surface rough with little timber. Water is available in Bear Creek. A power line passes within a few hundred feet.

There is one vein, about 2 feet in width, which strikes east and dips 60° S. Developed by a tunnel, 1000 feet long. The mine has not been worked for many years.

Rose Mine comprises two claims located one mile east of Mt. Bullion adjoining the King Midas Mine on the southeast. They contain the extension of the gold-bearing talcose ledges found on the former. Rose Mine claims are under lease to J. W. Stennett of Mariposa, and associates R. E. Silvear, Mariposa, and George Humes of Watsonville. The formations and character of the ore here are essentially the same as described under King Midas Mine. An incline shaft with gas engine hoist, which had reached a depth of 50 feet at the time of visit, is being put down on one of the talc veins. There is no milling equipment as yet. It is the intention of the owners to sink at least 300 feet. Two men are working.

Rutherford and Cranberry Group. The Rutherford and adjoining Cranberry Mine and mill site were patented in 1874 a few years after their discovery. Other claims have been consolidated with these and the group now comprises eight claims and mill site with a water right on the Merced River for 1500 inches of water. Owner, F. E. Bass, 2801 Union street, San Francisco. Some production was made during the 80's from shallow workings, the ore being worked in an arrastra. There has been little or no work for the past 25 years, but in September, 1927, a lease was given to R. A. Fredericks, of El Portal, who has started drifting on the Rutherford vein.

The property is situated in Secs. 15 and 22, T. 3 S., R. 19 E., the claims extending from Merced River northward toward the top of the rugged river canyon, the elevation ranging from 1560' to 2650'. Yosemite Valley Railroad crosses the lower end of the property, the station at Incline being within 200 yards. Yosemite Valley highway is on the opposite side of the river. San Joaquin Light and Power Company's lines also cross the property. There is some oak and bull pine.

The country rock is granite, intruded by dikes of fine-grained diorite and accompanying gold-bearing quartz veins. Four veins have been proven mineralized and five others have not been prospected. The principal vein is 1 to 5 feet in width and carries free gold with some pyrite, arsenopyrite and a little galena. The foot and hanging walls may be either granite or diorite. They are firm and stand well. The strike is in general north-south and dip 70° to 80° E., but both strike and dip of the different veins and cross-veins may vary considerably. The main vein has been proven on the surface for several hundred feet and several ore shoots have been mined, one of which is stated to have milled \$20 per ton. The greatest depth reached is 120', by shaft; there are also tunnels 400', 800' and 100' in length, with a little drifting and other underground workings. There is no equipment. The Original and Hite mines are the nearest developed properties, the distance to the latter being less than a mile.

Ruth Pierce Mine (Grimshaw). The Ruth Pierce was one of the four quartz mines, producing at the time the last previous report on Mariposa County was prepared (1920). The property consists of two claims on patented agricultural land, situated in Sec. 13, T. 5 S., R. 16 E., four miles by road east of Hornitos. Owner, Tennessee Mining

Company, c/o H. Ward Dawson, 833 Market street, San Francisco; formerly known as *Hornitos Gold Mining Company*, who took over the mine in 1916. It is one of the better known mines of the county and is developed by a shaft 600 feet deep with six levels. The first level has been drifted 350 feet, the second 640 feet, the third 600 feet, the fourth 305 feet, the fifth 1100 feet and the sixth 800 feet. When last active, one shift per day was working and 350 to 400 tons of ore, averaging \$9 a ton, was milled per month. Tailings are said to run \$2.50 a ton and about \$20,000 worth are impounded. There are three quartz veins, 4 to 5 feet in width between slate and diorite walls. Their general strike is east-west and dip 65° N.

The property was equipped with a complete 10-stamp mill, 1050-lb. stamps, plates and Frue vanners. Electric power was furnished by the San Joaquin Light and Power Company for operating the mill, compressor and mine hoist. Operations have been intermittent in recent years. In 1927 the mill and some other surface equipment was destroyed by fire. Repairs are under way at present, a new gallows frame having just been completed.

San Domingo Mine (Buffalo) consists of one full claim, which has been recently patented. Owned by W. S. Zeller, 949 Excelsior avenue, Oakland. The mine is located in the Colorado district, in Sec. 13, T. 4 S., R. 18 E., eight miles northeast of Mariposa. The elevation is 3000 feet, and topography rough. There is some timber, but water is scarce. A vein of free-milling quartz, averaging 2 feet in width, strikes northwest and dips 50° NE., between a slate footwall and granite hanging wall. It is opened up by a few hundred feet of tunnel, with some raises and winzes. Idle.

Schoolhouse Mine consists of one patented claim, owned by Mrs. Carmela Maschio, located on the patented Maschio ranch land in Hunter Valley. The mine is in Sec. 10, T. 4 S., R. 16 E., about 12 miles north of Hornitos, or six miles by trail from Bagby. It is opened up by an incline shaft and there has been some drifting on the vein. It is equipped with a 2-stamp mill with concentrator, operated by a gas engine, a hoist with 20-h.p. engine, blacksmith shop, etc. About 1916 Milton Sutherland was operating it under lease but a disagreement arose and it was closed down. Mr. Sutherland again opened up the mine in 1923 and took out some extremely rich free gold ore which he had exposed on two levels. The vein is dark, free-milling quartz which lies between porphyry walls. There has been little doing since 1923.

Schroeder Group consists of four lode claims and one placer claim, a total of 100 acres, owned by J. A. and C. J. Schroeder of Mariposa, P. W. Judkins and C. H. Weston. The property is in the Colorado district in Sec. 16, T. 4 S., R. 18 E., two miles by trail south of Saxon Creek station on the Yosemite Valley Railroad.

Elevation, 2500 feet; topography rough and well timbered, but with little water available except in winter. There are several veins, varying from a few inches to 3 feet in width, with a porphyry footwall and slate on the hanging wall. Their general strike is north and dip 80° E. There is a nearly flat blanket vein, which cuts the other veins. The mine is usually worked some each winter through an open cut over 400 feet long and 60 feet deep, and several hundred feet of drifts, the

material being worked down to the blanket vein. Equipment consists of a 5-ft. Huntington mill, run by a Knight water wheel, track, cars, blacksmith shop and boarding house.

Sebastopol Mine comprises one claim situated in Sec. 32, T. 5 S., R. 19 E., about $1\frac{1}{2}$ miles southwest of Bootjack. Formerly owned by L. L. Hart of Mariposa, but recently purchased by Belle McCord Roberts, Long Beach, California. There is a strong quartz vein on the claim, which has been prospected both on the surface and by tunnels. The vein is in the contact zone between slate and the granite intrusion which extends on to Raymond and forms a part of the Sierra batholith. Samples from the Sebastopol Mine are reported as follows by Techow and Davis of Sacramento:

North face of vein in tunnel 100' from portal 5' wide.....	Gold \$3 29
Streak of quartz on footwall north face of vein in tunnel.....	Gold 2 45
South face of vein in tunnel, 5' wide.....	Gold 2 07
Streak of quartz in south face in tunnel.....	Gold 1 65
Picked sample quartz in tunnel.....	Gold 5 60
Quartz vein 2' wide near granite contact.....	Gold 3 72
Shallow cut on surface 80' above tunnel.....	Gold 2 06

Sierra Rica Mine consists of the Sierra Rica, King Solomon and King Solomon mill site, patented claims and the Barbara and Muriel unpatented claims. The property is situated in Sec. 14, T. 4 S., R. 18 E., about 2 miles south of Briceburg, on the Yosemite Valley highway. Owner, J. M. Graham and Amelia Wilson, 256 North Sixth street, San Jose. The elevation is 2800 feet, with rugged surface. Timber is scarce, but water can be obtained from Bear Creek and from springs.

There is one vein, averaging 4 feet in width on the contact between a porphyry footwall and slate hanging wall. Its strike is northeast and dip 70° SE. On the Sierra Rica there is a 450-foot tunnel and a 125-foot raise; on the King Solomon a 70-foot tunnel and a 60-foot raise, with some drifts on both. A little prospecting and drifting was done in 1919 but the property has not been worked to any extent recently. An electric power line crosses the claims and there is some equipment, including a 4-stamp mill, ore cars, blacksmith shop, boarding house and dwelling. There is about 100 tons of ore on the dump, assaying up to \$50 a ton. Reported to have had an early production record of \$300,000.

Silver Bar Mine. (See under Silver.)

Silver Lead Mine. The old Honeycomb, St. Gabriel and Silver Lead lode claims which were first located in the 60's were bonded in 1914 by W. A. Bradley and associates of Carson City, Nevada, under the name *Mariposa Mining and Milling Company*. This company put on a 5-stamp mill with 850-lb. stamps, plates and two concentrators run by electric power supplied by the San Joaquin Light and Power Company; also a compressor with 75-h.p. motor, air hoist, pumps, blacksmith shop and other equipment. They operated for about three years, and then shut down for two years. There is one quartz vein carrying free gold and sulphides in diorite country rock. It averages 1 foot in width, strikes northwest and dips 42° NE.; proved on the surface for 3000 feet. The vein is opened by a shaft 250 feet deep with two levels and about 500 feet of drifts.

The property is in Sec. 34, T. 4 S., R. 16 E., in an area of rolling

hills about five miles northeast of Hornitos. Elevation 1200 feet. No timber. Water is obtained from the mine and a spring.

In 1919 the property was again unwatered, preparatory to starting operations. It was active in 1920. The last operations were carried on under the name *Simpson Mining Company*, W. A. Bradley, superintendent. This company quit in 1922, and since then all machinery has been removed and the property has remained idle.

Spencer Mine. This mine comprises a single patented claim, located in Sec. 29, T. 4 S., R. 18 E., in the Whitlock district, about seven miles northwest of Mariposa. It is owned by Ada I. Harris, c/o A. E. Dart, 1728 Broad street, San Luis Obispo. Dart has been working the property during 1927.

The elevation is 2500 feet; topography rough, with plenty of timber for mining. Water is obtained from the mine and Whitlock Creek.

There is a quartz vein averaging 5 feet in width, which strikes northwest and dips 80° NE. The footwall is diorite and the hanging wall is slate. The vein is developed by a 150-foot crosscut, a 50-foot winze and a stope 350 feet long by 150 feet high. Equipped with track, cars, pump, blacksmith shop and cabin. There is no mill, but the Austin group 10-stamp mill is located only a short distance away.

Spread Eagle Group comprises five claims and a fraction, the Spread Eagle, Empire, Miners Hope, Mohawk, Monarch and Tollgate Fraction, located in Secs. 29 and 32, T. 4 S., R. 18 E., in the Whitlock district, about six miles by road north of Mariposa. These claims have been held by various owners in the past as separate mines. More recently they have been owned by Nick Mullin of Mariposa. In 1927 Mullin sold the group to Belle McCord Roberts of Long Beach, California, the present owner. Intermittent work has been carried on here over a long period. The most recent activity, aside from assessment work, was in 1918, the ore at that time being milled in the Austin mill, 1½ miles distant.

The formations in the Whitlock district are slate and greenstone. Most of the veins occur in the greenstone, but in some of them slate forms one wall. There are several veins on the Spread Eagle Group, varying from 2 to 6 feet in width. Those on the contact of slate dip to the east, while those in the greenstone stand nearly vertical. There has been a large amount of work done on this property, but most of the old workings are inaccessible. On the Spread Eagle there was a 210-ft. shaft with two levels and nearly 1000 feet of drifts on the vein. The Spread Eagle adit level follows a vein for 1000 feet, but does not reach a depth of over 100 feet from the surface. The Miners Hope tunnel is 50 feet below the Spread Eagle. It intersects a 3 to 6 foot flat vein dipping east, which has been drifted some distance.

Equipment on the property includes a 5-stamp mill with plate, air compressor and gas engine, all in fair condition. Water is available from a creek and springs, and electric power is within three miles. The following are assays of samples reported by Techow and Davis, Sacramento:

Vein exposed by placer workings-----	Gold \$5 75 a ton
North drift Miners Hope tunnel vein, 4 feet-----	Gold 4 86 a ton
Miners Hope tunnel, north face 3 feet-----	Gold 8 24 a ton
Spread Eagle tunnel 18" quartz on hanging wall-----	Gold 7 20 a ton

Stockton Creek Mine is another of the 'Mariposa Grant' prospects, situated in Sec. 24, T. 5 S., R. 18 E., one-half mile east of Mariposa. There are two veins of free-milling quartz, each about $2\frac{1}{2}$ feet in maximum width. The country rock is diabase. The main vein strikes east and dips 45° S. and is probably an extension of the Mariposa vein, worked in the Mariposa Mine. Workings consist of an incline shaft 135 feet deep, with two levels, the upper drifted 250 feet and the lower level 300 feet; one stope about 100 feet long by 70 feet high and 3 feet wide. The discovery was made in the 50's. Subsequent to early operations, it was worked a little by lessees at intervals between 1900 and 1915, the total output during this latter period being 592 tons, which averaged \$19 a ton in value. All equipment has been removed, and it has now been idle for over ten years.

Sweetwater Mine. This property is located at Sweetwater, in Secs. 17 and 20, T. 4 S., R. 19 E., and comprises ten lode claims. Owned by C. A. McCartney, Jerseydale. It is an old property and has been worked at intervals for many years. In 1919 it was under bond to *Dominican Mining Syndicate, Inc.*; H. L. Schultz, president, and W. J. Minville, secretary, Coalinga, and the 10-stamp mill was being overhauled, preparatory to beginning operations.

There is a quartz vein, which swells and pinches, but averages about $2\frac{1}{2}$ feet in width, in granite. It strikes northwest and dips 45° SW. A slate formation occurs just north and west of the mine.

The elevation is 3800 feet. The topography is rugged and the surface well timbered. Water is piped from the head of Sweetwater Creek.

The mine is developed by an incline shaft, 170 feet deep, with a level at 123 feet. There are 1200 feet of drifts, a crosscut of 600 feet and several raises and stopes. Besides the mill, there is an assay office, blacksmith shop, boarding house, bunkhouse and other buildings. Idle.

In March, 1928, McCartney reported that he had sold the mine to Frank Zichosch and associates of San Francisco, and that the new owners expected to start work at once.

Trabucco Mine comprises 80 acres of patented land situated in the Colorado district and reached by a one-mile trail from the new Yosemite highway. Briceburg is the nearest town. This property was recently purchased by Belle McCord Roberts, Long Beach, California, from Peter Trabucco, whose family owned it for many years. The property was not visited. According to a report made for the present owner by Walter Techow of Sacramento, a quartz vein averaging 5 feet or more in width, which has been traced for more than a mile, passes through the property, 2000 feet of the vein being within this ground. The main vein is on the contact of granite and slate. It dips to the east and is intersected by a number of cross veins coming in from the granite on the east, the latter veins dipping to the south. Most of the work done in the past was on the cross veins near the intersections where high-grade specimen ore occurred. This was recovered with mortar and pestle. The workings are all shallow. Water and timber are found on the property, and there is a power line within a short distance.

Samples taken from the remains of old dumps assayed as follows:

From cross vein dump—	
No. 1	Gold \$6 58 a ton
No. 2	Gold 7 20 a ton
From main ledge dump	Gold 4 12 a ton

Turner Group comprises three claims, which parallel the Monte Christo Group in Sec. 20, T. 4 S., R. 20 E., about four miles east of Jerseydale. The vein carries free-milling ore with occasionally a little galena. It is being developed by the owner, A. E. Turner of Jerseydale.

Tyro Mine (Rittenhoffer) consists of one patented claim, located in Secs. 9 and 10, T. 3 S., R. 16 E., about four miles north of Coulterville. It is owned by A. M. Easton, 225 Mills Building, San Francisco. The elevation is 2300 feet, and the country rugged, with very little timber or water. There is one vein, 2 feet in width, between slate walls. It strikes northwest and dips 60° NE. The mine is developed by a 700-foot shaft, with six levels, 1400 feet of drifts and several raises and stopes. It has not been worked for many years. An old 10-stamp mill and other equipment formerly on it has been removed.

Uncle Jim Gold Mine comprises the Uncle Jim Group of eight claims, including placer and quartz, and the adjoining *West Point Group* of four placer and quartz claims. Owner, Wm. H. Rykert, 778 Ruthupham avenue, Rose Hill Station, Los Angeles; mine address, Clearing House. These holdings are situated at the junction of the South Fork with Merced River. The placer ground was first worked in the early days. Indian White Water Springs and the South Fork of Merced River would furnish water for hydraulicking and sluicing. Old ditches on the property are in bad shape, and only a little hand work is being done. The concrete bridge over the South Fork on the new Yosemite highway crosses the claims. The State Highway Commission maintained a large construction camp on the property during the building of the highway and bridge, which delayed development operations for the past three years.

Virginia Mine (Virginia-Belmont). This is one of the more important Mother Lode mines of Mariposa County that has been productive in recent years. It was formerly owned, and operated from 1912 to 1919, by the *White Gulch Mining Company*, now defunct. Their successor, the *Virginia-Belmont Mining Company*, 314 Kohl Building, San Francisco, which was incorporated in Nevada in 1920, acquired the property and operations were continued steadily until 1923, when this company closed the mine down. It remained idle until late in 1927, when it was taken over by *Nevada Hills Mining Company, Reorganized*, a well-established operating company; address, 208 Reno National Bank Building, Reno, Nevada; branch office, 321 Grant avenue, San Francisco; H. G. Humphrey, president; H. Z. Peters, secretary-treasurer.

The Virginia Mine comprises five patented claims, the Virginia, Virginia No. 2, Piedmont, Claremont, and August Belmont, having a total area of 100 acres; also the Coe Gulch placer claim. The property is in Secs. 13 and 14, T. 3 S., R. 16 E., three miles south of Coulterville, or eight miles by road north of Bagby, the nearest railroad station. The road from Bagby to Coulterville passes the property.

The vein in the Virginia varies in width from a narrow seam to a wide ledge, often swelling into lenses. It strikes a little west of north and dips 65° easterly, following the contact of serpentine on the footwall and diabase on the hanging wall.

There is a 1000-ft. shaft with adit level, over 6000 feet of drifts, with numerous crossecuts, raises, winzes and many stopes. One ore shoot is said to have been continuous from the surface to the lowest level (683 feet vertical) and a winze from this level, in the shoot, 100 feet deep showed ore averaging \$25 a ton in gold, with a little silver. The average value of all ore milled in 1918 was \$17.50 a ton. Compared with many other Mother Lode mines, the deepest workings here are very shallow and the vein has been developed for only a small portion of its length.

The mine is completely equipped with a 10-stamp mill (1080-lb. stamps), Blake rock-crusher, Challenge feeders, two plates 4 by 16 feet, two concentrators, 3½-ft. Hardinge mill, and a third plate. Tailings from the concentrators were reground in the Hardinge mill and then passed over the last plate. The mill and mine are equipped for operation with electric power. There is a 50-h.p. Ingersoll-Rand compressor, No. 5 I.-R. drill sharpener, air-drills, cars, track, pumps, a blacksmith shop, office, boarding house, residences, etc.

The new owners put a crew at work in the latter part of November, 1927,¹ and began overhauling the mill and opening up the upper levels, preparatory to complete unwatering of the mine. A good tonnage of milling ore is reported exposed in the upper workings and the mill will probably be started before the mine is entirely free from water. Operations are under the direction of Mr. R. K. Brown, mine superintendent.

Washington-Buena Vista Group. This group comprises five claims: Buena Vista (Busch), Washington, Phoenix, Lucky Lindy and Charles, located in Sec. 21, T. 4 S., R. 18 E., in the Colorado district. Owned by Belle McCord Roberts, Long Beach, California. Most of these claims have not been worked for many years. Some mining equipment was put on them by former owners as late as 1919, but no production was made. The elevation is 3000 feet. Water can be obtained from the mine and springs. An old shaft on the Washington claim is standing full. There is also an old 4-stamp mill here and steam hoist of little value.

A strong quartz vein coursing a little north of west can be traced for a mile through the group. Most of the former workings on it are on the Washington and Buena Vista ground. The vein is from 2 to 7 feet in width between slate walls.

The following are the results of assays made by Techow and Davis of Sacramento, who recently examined and sampled the vein for the present owner:

Washington claim, shallow shaft, ore 2½ ft. wide.....	Gold \$32 96 a ton
Buena Vista tunnel, 7 ft. of ore.....	Gold 8 24 a ton
Buena Vista tunnel, 7 ft. of ore.....	Gold 12 36 a ton
Buena Vista tunnel, 6 ft. of ore.....	Gold 10 40 a ton
Buena Vista dump, old shaft	Gold 6 40 a ton

In the latter part of 1927 two men were employed and an old tunnel, apparently run on a parallel stringer vein, and a crossecut to the main

¹ Reports received in March, 1928, after the above was written, state that the mine has been unwatered to the 500-ft. level and some excellent orebodies opened up; that the mill is operating, and that 21 men are employed.

vein were cleaned out. Where intersected by this crosscut the vein showed 5 to 6 feet of milling-grade ore, and a drift along the vein for 20 feet showed no marked change. The work of cleaning out the tunnel beyond the crosscut was then begun and it was reopened for a distance of about 100 feet beyond the first crosscut, where it was turned south-easterly to the vein and another westerly drift on the vein started. This drift showed increasing values and at a distance of 20 feet a sample showed several hundred dollars a ton in free gold and the vein fully eight feet in width. The last few feet driven in March, 1928, exposed a face liberally sprinkled with visible free gold. Grab samples and pannings indicated values up to several thousand dollars a ton. As rich ore is said to have been found in an old abandoned shaft 200 feet distant, it is possible that this discovery is on one end of a rich ore shoot of considerable size.

Electric power is available within a few miles.

Washington No. 2 Mine is an old property that has not been worked for many years. It consists of three patented claims, the Washington, Josephine and Jenny Lind, totaling 40 acres, and situated in Secs. 4 and 5, T. 5 N., R. 16 E., about five miles north of Hornitos. It is said to have been a very large producer in the early days, and the deepest mine in that district, when operated. There is an incline shaft, 1500 feet deep. The vein strikes north, dips 65° E. between slate walls, and is stated to have been 12 feet wide. It is owned by Mrs. Emeline Parker and the Mariposa Land Co., 19 Bacon Building, Oakland, California.

West Point Group. (See Uncle Jim Gold Mine.)

Whitlock Group. This group consists of three claims, patented in 1897, the Whitlock, Alabama and Westward, owned by Dr. F. E. Gallison and Lizzie Sain, 2821 Cherry street, Berkeley; total area, 45 acres. They are located in the Whitlock district, in Sec. 32, T. 4 S., R. 18 E., six miles northwest of Mariposa. The elevation is close to 3000 feet, surface quite rugged and not much timber, but there is sufficient water to run a 20-stamp mill.

Three quartz veins, averaging 4 feet in width, occur in greenstone country rock. Development consists of a 900-foot shaft with four levels, about 3000 feet of drifts, an 1800-foot drain tunnel and other workings. The mine was at one time completely equipped with a 20-stamp mill and considerable ore has been stoped. Steam power was used, and with wood at \$4.25 a cord operations would not pay, and the mine was shut down in 1899. The 20-stamp mill and all equipment is now gone. There is said to be a large tonnage of \$4 ore still in the mine.

Yellow Metal Mining Company. This company is now operating the Yellow Metal group of four unpatented lode claims, formerly known as the *Live Oak Mine*; situated in Sec. 17, T. 4 S., R. 18 E., in the Colorado district. Address, Yellow Metal Mining Co., 40th and Hollis streets, Emeryville; Richard Jeffrey, Briceburg, California, superintendent and manager. There are two veins, one averaging 2 feet and the other 8 inches in width, on the contact between a greenstone foot-wall and slate hanging wall. The strike of the veins is north and their dip 45° E. The ore is free-milling quartz.

Development consists of four shallow shafts, a 200-foot crosscut and drifts on the veins. The mine has been recently equipped with a new 2-stamp Hendy mill, which is crushing ore from the 2-foot vein that is being drifted from one of the shafts. The milling results are reported to be satisfactory.

GOLD (PLACER MINES)

The gold placers of Mariposa County were exceedingly rich and the placer diggings swarmed with miners in the days when the length of a claim on many of the gulches was the distance a man could reach with his shovel. The great majority of these were shallow deposits in present-day channels and bars; the extensive auriferous Tertiary and Cretaceous channels preserved under lava flows farther north along the western slope of the Sierras not being developed here; neither are the immense banks of distributed gold-bearing gravels, such as were hydraulicked on an extensive scale farther north, found in Mariposa County. There has been no extensive development of water supplies or ditch systems constructed in this area, but remnants of small ditches can still be seen along many of the gulches. Some fairly large gravel deposits are found, however, in Pleasant Valley north of Merced Falls and some activity was noted in this district in 1927.

Tacoma Mining Company. George W. Tobin, Box 95, La Grange, California, and associates have secured a lease on 2600 acres of the Prouty Ranch in Secs. 5 and 6, T. 3 S., R. 15 E., known as the *New Year Diggins*. Work preparatory to hydraulicking was begun in 1927, operating under the name of Tacoma Mining Company.

The deposit is eight miles southeast of La Grange and seven miles northeast of Merced Falls. There are estimated to be from 350,000 to 400,000 cu. yd. of gravel available. At the deepest point found it is 47 feet to bedrock. Most of the gold is rather fine and a little platinum occurs with it. The average value is stated to be from 75¢ to \$1 a yard. Quartz seams in the porphyry have been worked for pockets at times in the past and a number of small pockets taken out.

As water is not abundant, the company first proposed to build a storage reservoir and sluice by pumping from the reservoir to a total height of 200 feet, but later decided to do away with pumping, and bring water from Browns Creek through a pipe line, 2500 feet in length. This 12-inch wood-stave pipe was being installed in November, 1927.

Huelsdonk Placer. In 1926 W. A. Huelsdonk operated one of his Huelsdonk concentrators on an adjoining gravel deposit and recovered fine gold and platinum. The gravel was sluiced down to the machine by water supplied by a 2-inch pipe line and pump.

IRON

Iron ore, mainly magnetite, has been found as float and in small quantity at a number of localities in the county, but it is probable that no commercial deposits exist here.

Masses occur at the base of Mt. Hoffman, in Yosemite National Park, and small quantities have been found on Big Spring Hill, three miles east of Mariposa.

Arthur J. Giles of Hornitos has submitted samples from that vicinity and it occurs as gossan associated with the copper deposits in the southwestern part of the county.

MANGANESE

No manganese ore was produced in Mariposa County even during the late World War period when this ore was in strong demand, but several occurrences have been noted. It has been found at Jasper Point; in small masses in Hunter Valley; in the first gulch on the north side of Merced River west of the Mountain King Mine, and in small amount with jasper in Indian Gulch in Sec. 23, T. 3 S., R. 17 E. Most of these deposits are of doubtful commercial value on account of lack of size, uncertain grade, or their inaccessibility.

PLATINUM

Platinum was reported discovered in 1919 in Devils Gulch on claims located in Secs. 1 and 12, T. 4 S., R. 19 E., five miles by trail from Jerseydale. The ore was said to assay \$90 a ton in platinum, \$44 in gold and to carry small amounts of cobalt, nickel and tin.

It is also reported to occur on a claim of the Little Wonder Mining Company in the same district.

These supposed occurrences have not been confirmed by the Division of Mines and Mining.

QUICKSILVER

Cinnabar occurs in small quantity associated with gold quartz in a 6-inch ledge on Merced River, near Coulterville, but it is not in sufficient quantity to be of value as a source of quicksilver.

SILVER

Silver Bar Mine (Silver Mine; also Bryan Mine). Property consists of four claims, the Silver Bar No. 1, 2, 3 and 4, owned by Susan McNally, Mariposa. The mine is in Sec. 15, T. 6 S., R. 19 E., about three miles south of Bootjack and six miles by road southeast of Mariposa.

A. D. Lane et al., Mariposa, took the mine under lease and bond in August, 1927, since which time they have started development, carried on metallurgical tests and begun reconstruction of the mill on a new site near the shaft.

The deposit is a fissure vein in granite, with a maximum width of 15 feet at the east end of the claims. It strikes nearly due east and dips 70° N. Sugar quartz occurs in the upper portion of the vein. The ore carries an average of \$5 in gold and 20 oz. of silver, mainly in the form of argentite and various antimonial and arsenical silver sulphide minerals. In places it is heavily mineralized.

LIST OF PATENTED MINES WITH OWNERS' NAMES, FROM COUNTY ASSESSOR'S TAX LIST.

Name	Lode or Placer	Owner	Location		
			Acres	Sec.	T. R.
A. Alabama					
Alta		See Whitlock.			
American Eagle		See Sweetwater. ½ H. L. Kopp, R.F.D. 1, box 343, Campbell; ½ John B. Morrison, and ½ Emma J. Vallerdi, Pine Grove----- See Virginia.	20	30	4 16
August					
B. Badger					
Barium No. 1		See Grand Prize. See East Barite.	67	21, 28	2 17
Bear Creek Group		Ben C. Hill, c/o Best Steel Casting Co., Hobart Bldg., San Francisco.	9	29, 30	3 17
Belmont		½ James and John Lindsay, ½ E. A. Wheeler, Coulterville----- See McCall.	{ 20	13	4 16
Big Lode		½ John B. Morrison and Emelia J. Vallerdi, Merced; ½ Emelia J. Vallerdi, Pine Grove-----	26	5	16
Bill Jones		Mrs. M. H. S. Bannister, c/o R. B. Harper, 8 Porter Bldg., San Jose.	6	4	18
Blue Bell		See Blue Bell.	20	25	2 17
Blue Lead		Eva L. Fenn, et al., 24 La Sale Ave., Trenton, N. J.-----			
Boggs and Baitelle					
Bonanza		Estelle I. Fraser and Geo. Frank, Coulterville----- See Hasloe.	20	7, 8	3 18
Bondurant		½ Mrs. N. C. Ray; ½ Mrs. Mary A. Mentzer, Coulterville, et al.; 1/6 Mrs. Perimilia P. Hagar, Coulterville----- See Virginia.	15	28	2 16
Carrie Todd		Mrs. Emma Dearborn, 328 2d St., Richmond, et al. (½ P. W. Jenkins) ½ Chas. H. Weston, 433 9th St., Richmond----- Marble Spring Gold Mining Co., 547 Central Ave., Alameda Columbus Cons. Gold Mining Co., c/o C. Dondoro, 3220 Genoa St., Oakland----- See Merced Placer.	7	27	4 18
Century			42	30, 31	2 18
Champion			60	8, 9	3 16
Claremont		See Goodview.			
Colorado					
Compromise, Embanks					
Cons. Eureka, Lafayette and Eastern Star					
Coolgardie					
Copper King and M. S.					

Copper Queen.....								
Costa, Placer.....								
Cranberry, Rutherford and M. S.								
Crown Peak and M. S.								
Crown Point.....								
Daisy.....								
Diltz and Mann, Vanderbilt.....								
Domingo and M. S.								
Doss.....								
Duncan.....								
East Baryte, North Barium, South Barium, Barium No. 1.....								
Eastern Star.....								
Enterprise.....								
Eubanks.....								
Excelsior Group.....								
Felicia and M. S.								
Francis.....								
Fremont Drifting and Mining Co. Placer.....								
Garibaldi.....								
Geare.....								
Georgia Point and M. S.								
Giltner and M. S.								
Golden Eagle.....								
Goodview, Rothschild, S. A., Sunset, Crown Point, Little Giant, San Jose, Stonewall Jackson, Copper King and M. S.								
Grand Prize, Badger.....								
California Copper Producers Trust et al., c/o A. B. Smith, 629 Call Bldg., San Francisco.....	20	3	8	8	18			
See La Victoria.								
F. Bass, 2801 Union St., San Francisco.....		15, 22	3	3	19			
Geo. E. Gamble, 1431 Waverley St., Palo Alto.....		35, 36	3	3	16			
See Goodview.								
D								
See Merced Placer.								
Mrs. Jennie E. Diven, 147 Kempton Ave., Oakland, et al.	{ 1, 2, 11, 12 29	5	19					
Geo. Barrett, Coulterville	25	4	18					
L. A. Giacca, Hornitos.....		28	5	16				
Geo. D. Turner, Hornitos.....	44	16, 21	5	16				
E								
El Portal Mining Co., Thos. Turner, Secy., 910 American Bank Bldg., San Francisco.....	18, 19	3	20					
See Cons. Eureka.								
Enterprise Mining Co., c/o R. Bancroft, Merced.....		2	5	16				
See Compromise.								
James Burns, c/o Merced Irrigation Dist.	67	17, 20	3	16				
F								
Morris Farber, 462 Phelan Bldg., San Francisco.	20	7, 17	4	19				
Oleese Estate Co., c/o St. Louis Olcese, Bakersfield.....	30	19, 30	6	18				
B. A. and Everett Bagby, Bagby.....	41	6	4	17				
G								
W. R. English, Box 333, Sonora.	20	4, 9	3	18				
Jesse S. L. Potter, c/o J. S. Potter, 214 American Bank Bldg., San Francisco.....	20	30	4	18				
See Spring Tunnel.								
Mrs. Annie M. Peterson, Mariposa.....	60	3	5	19				
Samuel L. Thrift, Lydia J. King, Catherine M. Thorne, 420 Channel St., Stockton.....	{ 5, 8, 9 32	8	18					
Oaks and Reese Mining Co., Hornitos.....	26	4	4	16				
Grand Prize, Badger.....		33	3	16				

LIST OF PATENTED MINES WITH OWNERS' NAMES, FROM COUNTY ASSESSOR'S TAX LIST—Continued.

Name	Lode or Placer	Owner	Location		
			Acres	Sec.	T. R.
Hasloe, Century		J. S. Morgan and Sons, 614 3d St., San Francisco	40	1, 2	3 17
Hite and M. S. Priest, McConley and M. S. Giltner and and M. S., Summit and M. S., Old Dominion	L	James S. Spilman, 244 Kearny St., San Francisco Dr. Owen Buckland, 391 Sutter St., San Francisco; Margaret Foyzer, et al.	60	22, 26, 27	3 19
Hite Central and M. S.				22, 27	3 19
Indian Gulch	L	Campbell and Carr, 2225 E St., Bakersfield	20	34	5 16
Jenny Lind					
Josephine		See Washington.			
Jubilee		See Merced Placer. A. Zirker, Box 554, Merced	20	19, 30	4 17
Juniper	L				
Lafayette					
La Victoria, Tandeur and M. S., Costa Placer		Mrs. Susan A. Lang, 2253 Fulton St., San Francisco	40	4, 10	4 16
Little Giant		See Goodview.			
Little Judge and M. S.		See Pinon Blanca.			
Louisiana		C. P. Treat, 426 Palo Alto Ave., Palo Alto		25, 26	2 17
Lovely Rodgers		Mrs. Nettie Hauck, Yosemitic		11	3 17
Martinez					
McCall, Bill Jones		Mrs. E. J. Hammah, 909 E. Yosemitic Ave., Madera		21	5 16
McConley and M. W.		No. 9 Gold Mining Co., c/o L. A. Ginana, Hornitos		10	5 16
Menlo	L	See Hite and M. S.			
Merced Gold Mining Co.		Henry J. Aden, Box 242, Vallejo	56	22, 23, 26, 27	4 18
Merced Placer (P), Stevenson (L), Daisy, Jubilee, Syndicate, Coolgardie	P	A. S. Bigelow and G. M. Hyams of Boston			3 16
Mocking Bird		Percy L. Pettigrew, 1227 Flood Bldg., San Francisco (90 ac. placer, 75 lode)	165	36	3 16
		C. J. and J. A. Schroeder, Mariposa	20	27	4 18

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Morning Star-----	Q/10 Jos. J. Trabucco, Mariposa, et al.	11, 12	4	16
Mountaineer No. 1-----	See New Year.	{ 31 6	3 4	18
MT. King group of 18 patented claims-----	Mountain King Mining Co., 314 Kohl Bldg., San Francisco-----	348		
New Year, Wild Cat, Mountaineer No. 1-----	Angele Beaudry and Jos. F. Bouvier, 4 Laguna St., San Francisco-----	59	29, 30, 32	3
North Barium-----	See East Baryte.			
North Pinon Blanco-----	See Pinon Blanco.			
North Whitlock-----	W. J. Dusel, 340 Arlington rd., Redwood City-----	32	4	18
Old Dominion-----	O			
Old Judge-----	See Hite and M. S. See Pinon Blanco.			
Piedmont-----	P			
Pinon Blanco, North Pinon Blanco, Old Judge, South Judge, Little Judge and M. S.-----	See Virginia.			
Placer-----	Oro Rico Mines Co., c/o A. E. Towers, Metropolitan Club, New York	95 20	19, 20, 29 33	2 4
Priest-----	W. D. Weston, Mariposa-----			16 18
Quartz Mine-----	Q			
Rittershoffer (Tyro)-----	John J. White, c/o C. White, 707 Florodora St., Fresno, et al.-----	22	10, 15	5
Roma and M. S.-----	R			
Rothschild-----	A. M. Easton, 225 Mills Bldg., San Francisco-----	25	9, 10 14	3 4
Rutherford and M. S.-----	M. A. and Frank H. Harris, 5th and Brannan Sts., San Francisco-----			16 18
S. A.-----	S			
San Jose-----	See Goodview. See Goodview.			
Santa Clara-----	H. O. Davis (Mrs. M. L. Cooke), 3864 Platt Ave., Fresno-----	20	25	4
Schoolhouse-----	L Mrs. Carmela Maschio -----		10	18
Schroeder-----	Juddins and Schroeder, Mariposa-----		16	4
Sierra Rica-----	Amelia Wilson and J. M. Graham, 256 N. 6th St., San Jose-----	10	14	18
Silver Right-----	See Sweetwater.			
South Barium-----	See Pinon Blanco.			
South Judge-----	See Spring Tunnel.			
Southside-----	See Sweetwater.			
Southern Cross-----	Ada I. Harris, c/o A. E. Dart, 1728 Broad St., San Luis Obispo-----	20	29	4
Spencer-----				18

LIST OF PATENTED MINES WITH OWNERS' NAMES, FROM COUNTY ASSESSOR'S TAX LIST.—Continued.

Name	Lode or placer	Owner	Location		
			Acres	Sec.	T. R.
Spring Tunnel, Southside, Georgia Point and M. S. Standard		Geo. Auch, et al. A. J. Elftman, trustee, 2329 Parker St., Berkeley See Merced Placer.	45	26, 27, 34 33	3 4
Stevenson	L	See Goodriew.			19 18
Stonewall Jackson	P	Ulysses S. Martin, 97 Webster St., San Francisco See Hite and M. S.	20	25	2
Success Nugget		See Goodriew.			17
Summit and M. S. Sunset		John Demartini, Bagby See Merced Placer.	74	19, 29, 30	3
Sweetwater, Alta, Southern Cross, Silver Right					17
Syndicate					
Talc	T	Catherine Cucco, Coulterville See I.A. Victoria. See Rittershofer.	20	19	3
Tandem and M. S.	V				17
Tyro					
Vanderbilt		See Diltz & Mann. G. S. Chambers, 416 E. Walnut St., Lodi	40	35	2
Violet					17
Virginia, Virginia No. 2, Piedmont, Claremont, August Belmont		Virginia Belmont Mining Co., Coulterville. Also Coe Gulch Placer-land See Whitlock.	100	13, 14	3
Washington, Josephine, Jenny Lind	W	Mrs. Emeline Parker and Mariposa Land Co., 19 Bacon Bldg., Oak-Gallison and Lain, 2821 Cherry St., Berkeley See New Year.	40	4, 5, 21	5
Westward					16
Whitlock, Alabama, Westward					18
Wild Cat					

LIST OF UNPATENTED MINING CLAIMS SHOWING TO WHOM ASSESSED, FROM COUNTY ASSESSOR'S ROLLS.

Year March, 1926, to March, 1927.

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Name	Lode or placer	Owner	Location		
			Sec.	T.	R.
[A]					
Agatha	P	Mrs. Elsie R. Devidio, Briceburg	10	4	14
Alder		See Grey Eagle.			
Alder Trail					
Alice	L	John F. Feenan, Bagby	36	3	16
Amador, Copper King		Shareholders Legionnaire Gold Mining Co. (defunct), c/o A. B. Smith, 629 Call Bdg., San Francisco.	3	8	18
Amelia and Amelia Ext.	L	The Tennessee Mining Co., c/o H. Ward Dawson, 833 Market St., San Francisco.	13	5	16
American		Hattie E. Obaw, Carlotta.	1	3	16
Annayoung, El Portal No. 10 Ext.		Leo H. Heutner and W. Von Greifenstein, El Portal.			
Antler		Cassius M. Joy, Security Trust and Savings Bank, Los Angeles.			
Argo		See Pioneer.			
Argonaut		See Subhurets.			
Arkell group 11 claims and 3 mill sites		Charles Arkell, Jerseydale.			
Austin group of 7 claims		Mutual Mining Co., 1723 Webster St., Oakland.			
Avarite		See Mary Bess.			
B					
Badger		See Robin.			
Bald Eagle		See Tomboy.			
Bald Eagle		See Sultan.			
Banner	L	Chas. S. Stewart, Coulterville.			
Barium Queen		Estate of Wm. Desario, c/o E. H. Baxter, 535 L St., Merced.	18	3	17
Bell		See Buffalo Bill.			20
Belle View		See Phoenix.			
Big Bonanza		Trujillo Mining Co., c/o F. W. McIntyre, 724 E. Broadway, Glendale.			
Big Bull Shoot Buck		See Reina De Los Mariposa.			
Big Oak, Del Monte, Thelmas, Sandy Bar		J. H. Towers, Mariposa.			
Billings, Buckeye		O. S. Evans, Hornitos.			
Bishop Creek		Jesse C. Werly, Mist.			

LIST OF UNPATENTED MINING CLAIMS SHOWING TO WHOM ASSESSED, FROM COUNTY ASSESSOR'S ROLLS—Continued.

Year March, 1926, to March, 1927.

Name	Lode or placer	Owner	Location		
			Sec.	T.	R.
Black, Confidence (P), Confidence No. 2, Confidence Placer		John L. Green, et al, 1673 Railway Exchange Bldg., St. Louis, Mo.	1, 12	4	19
Black Eagle		Dan Demartini, Bagby.	1	3	16
Black Jack		R. B. Dexter, Coulterville	8	5	20
Black Oak		M. Kane, Usonia	11	3	16
Black Sam, Yellow Pine		Frank Musante, Coulterville			
Blue Bird		See Lakeside.			
Blue Gravel		See Gold Center.			
Blue Jay		See Odin.			
Bob and Lank	L	Jack Gammon, Coulterville		3	16
Bonanza		See Elsie M.			
Bondurant East Ext., Bondurant West Ext.		See Shallalay.			
Bonita	P	See Garfield.			
Boulder		See Optimio.			
Boulder, Permit		Andrew J. Bitcon, Mariposa	20	4	18
Brown Bear Group	P	Theo E. Kochel, Mariposa	{ 31	4	18
Buck Shot		Daniel Heaton, Jerseydale	7	4	18
Buckeye		Albert Affolter, Mariposa			
Buffalo Bill, Florence, Dorothy, Bell, Margarita, Thelma		See Billings.			
Burna Creek	L	California Gold Mines Co., c/o W. A. Grantham, Hollywood Athletic Club, Hollywood		2	18
Buro		Y. R. Trabucco, Hornitos	34	4	16
Buzzard		F. H. Cathaywood, Jerseydale		4	20
Cabin	P	See New Discovery.			
Calderon		C			
Caldwell, Nelly Bly, Independence		Harold Brinham, 3817 Telegraph Ave., Oakland	23	3	19
Cannon Gulch		Arthur Jas. and Geo. Bauers, Hornitos	7	5	16
Carmencita		Juddkins and Schroeder, Mariposa	16	4	18
Castagnetto	L	See Cleveland.			
		See Optimio.			
		Mrs. Mary Castagnetto, 1223 E. Lindsay St., Stockton	26	2	16

Chance		19	4	17
Charles, Patricia	C. C. Schlageter, Mariposa			
Checkmate	See Shallaly.			
Cherry Tree	See Recorder.			
Chimes	L Harry Barrett, Merced Falls			
Chucaloda, Riverview, Evelyn	E. W. Grant, Hornitos			
Cincinnati, Ohio	A. W. Francisco, c/o C. M. Jay, 718 Washington Blvd., Los Angeles			
Colorado	P John J. Wildt, Jerseydale	27	4	17
Colorado group of 3 claims	John J. Wildt, Jerseydale Chas. H. Weston, 433 9th St., Richmond, and P. W. Jenkins, 1015 Nevin Ave., Richmond, et al.	27	4	18
Cleveland, Cleveland Ext., Cannon Gulch, Harry C.	Harry Taylor, Mariposa	28	4	18
Columbia	See Sulphurets.			
Commercial	See Iron Duke.			
Confidence	See Black.			
Copper King	See Amador.			
Coyote Hall	Agnes M. Bradford, c/o L. M. Bradford, Raymond	11	6	18
Croesus, Crown Prince	Croesus Mining Co., c/o M. D. Allen, 1735 N. Wilcox, Hollywood	6	4	17
Crystall	See Penobscott.			
D				
Darby	Mrs. Emma McDiarmid, Coulterville			
Dartmouth	M. S. Fraser and M. E. McLellan, Coulterville			
Deer Flat group of 6 claims	J. E. Trujillo, Coulterville	2		19
Del Monte	See Big Oak.			
Democrat	See Sulphurets.			
Desario group of 4 claims	Mrs. Helen Desario, 1744 Berkeley Ave., Stockton	34	3	19
Diana Mines No. 1, 2, 3, 4, 5, 6, 7, 8	California Gold Mines, Inc., c/o Mrs. E. M. Coplen, 1535 N. Hobart St., Los Angeles	30	31	2
Diehl group of 4 claims	A. W. Diehl, Coulterville	11	3	17
Doctor, Two Brothers, Yosemite Gold	Ias. L. Divine 147 Kempton Ave., Oakland	2	5	19
Minerals, Golden Reward	W. A. Smith, 930 E. San Fernando St., San Jose			
Domingo	Geo. Barrett, Coulterville			
Donald Mac	See Tomboy.			
Dorothy	Mrs. Melani J. Artru, c/o Mr. Camin, Mariposa	27	4	18
Dorothy	See Buffalo Bill.			
Douglas	See Iron Duke.			
Dreadnaught	See New Discovery.			
E				
Eagle Peak	See Marie.			
El Capitan group of 14 claims	El Capitan Gold Mining Co. of Nevada, c/o James H. Eaton, Union League Club, San Francisco	22	3	19

LIST OF UNPATENTED MINING CLAIMS SHOWING TO WHOM ASSESSED, FROM COUNTY ASSESSOR'S ROLLS—Continued.

Year March, 1926, to March, 1927.

Name	Lode or placer	Owner	Location		
			Sec.	T.	R.
Elizabeth -----	L	See Stepping Stones. F. E. Bass and John Yeager, 2801 Union St., San Francisco	22	3	19
El Portal, El Capitan -----	P	Hal Fredricks, El Portal	34	3	20
El Portal No. 10 Ext. -----	P	B. Horley, Wavona	34	4	21
El Rio No. 1 -----	P	J. C. Donelly, Jerseydale			
Elsie M. Bob and Lauk -----	P	See Chucalada.			
Eureka -----	P	Louis Trabucco, Mt. Bullion	11	4	16
Eureka, Oro Fino -----	P	See Monte Cristo.			
Evelyn -----	P	L. E. Tryon, Modesto	23	3	16
Evening Star, Evening Star N. W. Ext. -----	P	A. L. Soule, Sonora			
Excelsior -----	P				
Exchange, Great Giant -----	P				
Exposition -----	P				
Father -----	P				
Fanny Bell -----	P	See Prince.			
Farber group of 3 claims -----	P	E. T. Brooks, 830 Gage St., Los Angeles.			
Felicia Ext. No. 1, 2, 3 and 4 -----	P	United Building and Development Co., Golden Gate Theatre Bldg., San Francisco	24	4	18
Florence -----	P	Morris Farber, 445 Waller St., San Francisco.			
Fools Choice -----	P	See Buffalo Bill.			
Forest Haven -----	P	See Stepping Stones.			
Franklin, McKinley -----	P	E. I. Ingram, c/o M. S. Fraser, Coulterville	19	4	18
Fraser and Frank group of 8 claims -----	P	Fred Blum Mt. Bullion			
Fremont Trail, Quartz King -----	P	Estelle T. Fraser and Geo. Frank, Coulterville			
Garfield -----	P	C. M. Joy, 718 Washington Bldg., Los Angeles			
Garfield, Review, Bondurant, West Ext., Bondurant, East Ext., Tunnel -----	P	L. O. Wilson, et al., Coulterville	10	3	18
Ginaco No. 1 and 2 -----	P	Walter F. Ritz, Box 1648, Modesto			
Ginaco No. 3 -----	P	L. A. Ginaco, Hornitos	10	5	16
G. A. Darby -----	P	C. A. Darby			

Gloryn.....	J. L. Tiscornia et al., 524 Columbus Ave., San Francisco.....	25	3	16
Gold Central (L), Blue Gravel (P), Knob Hill.....	A. H. Hagan, Coulterville.....	6	3	17
Gold King group of 6 claims.....	Gold King Mining Co., Box 1648, Modesto.....	19, 32	2	18
Gold Road.....	See Shallay.....			
Gold Run, Red Hill.....	F. P. Sanchez, Hornitos.....	27	4	16
Golden Eagle.....	J. A. Brown, Capitola.....	7	3	18
Golden Gate.....	W. J. and Lulu M. Patterson, 1843 9th Ave., San Francisco.....			
Golden Reward.....	See Prince.....			
Golden Rule (L), Good Luck.....	John L. McLean, Coulterville.....	25	4	17
Good Luck (L), Good Luck.....	Eva Clark and Minnie Myers, Mariposa.....	25	4	18
Good Luck, Horseshoe.....	See Exchange.....			
Great Giant.....	James Gazzola, Coulterville, and Grey Eagle Mining Co., 1319 N. Main St., Los Angeles.....	30	3	17
Grey Eagle (L), Melba, Alder.....				
	H			
Happy Home.....	W. J. Patterson, 1843 9th Ave., San Francisco.....	7	3	18
Hard Luck.....	H. I. Shilling, Coulterville.....	24	3	17
Hard Luck, Pyrophyllite.....	Wm. E. Finch, Box 18, Sonora.....	30	3	17
Harry C.....	See Cleveland.....			
Heinholt.....	Robert Russell, Mariposa.....	20	4	18
Hidden Treasure, Sixteen to One.....	G. W. Garrett, Baby.....	31	3	17
Hidden View group of 6 claims.....	I. J. Blocher, 828 Myrtle St., Oakland.....	35	3	17
Hite Cove group of 3 claims.....	L. M. and E. R. Johnson, 356 W. 60th St., Los Angeles.....			
Home.....	C. J. and J. A. Schroeder, Mariposa.....			
Horseshoe.....	See Good Luck.....			
Horsehoe group of 14 claims.....	Clara Bibbero, and David A. Green, c/o D. H. Green, 2524 Mission St., San Francisco.....	16	4	18
Hove Lode.....	Chas. A. Hove, 3246 Million St., Pasadena.....			
	I			
Independence.....	See Caldwell.....			
Independence, Starlight.....	E. M. True, Bagby.....	30	4	16
Inspiration.....	See Platinum King.....			
Iowa, New York.....	Herbert H. and Chas. H. Carlton, Suite 1004, 111 W. Monroe St., Chicago, Ill.....			
Iron Duke, Douglas (L), Commercial.....	Jack Kojovich, Hunters Valley, Hornitos.....	29	4	29
		4	4	16
	J			
Johnnie F.....	See Ohio Placer.....			
Josie, Key Lode, Key Lode Ext.....	Chas. A. Darby, c/o B. S. McArthur, 1237 23d Ave., Oakland.....	10	5	16
Juliette, Buena Vista.....	California Copper Producers Trust et al., c/o E. J. Preston, 629 Call Bldg., San Francisco.....	3	8	18
Juniper.....	Chas. H. Burt, Mt. Bullion.....	25	4	16
June.....	A. W. Azebedo, Coulterville.....	3	3	17

LIST OF UNPATENTED MINING CLAIMS SHOWING TO WHOM ASSESSED, FROM COUNTY ASSESSOR'S ROLLS—Continued.

Year March, 1926, to March, 1927.

Name	Lode or placer	Owner	Location		
			Sec.	T.	R.
Key Lode		K			
Keystone		See Josie.			
Keystone		Francis L. Shirran, Yuba City			
King Saxon, Queen Sixxon		See Optimio.			
King Midas		Fred Mebold, Mariposa	21	4	18
Knob Hill		See Rainbows End.			
Lafayette		See Gold Center.			
Lakeside, Blue Bird					
La Mariposa					
Landrum		June Queirola, Hornitos	4	16	
Last Chance		O. P. Williams et al., Box 223, Oakland			
Lena		Sim Landrum, R.F.D. 1, box 16, Merced	34	4	18
Little Wonder group of 46 claims		P. R. Peterson, Coulterville			
Live Oak		Mrs. R. O'Brien, Millbrae			
Lone Star		T. A. Clark, 412 De Young Bldg., San Francisco	6, 7, 8, 9	4	15
Las Palomas		Mervin McElligott, Mariposa	10	6	20
Lost Fortorn		See Optimio.			
Lucky (L), Surprise		Yellow Metals Mining Co., 40th and Hollis St., Emeryville	17	4	18
Lucky Fourteen group of 4 claims		Joe F. Cardoza, Cathay			
Lucky Fourteen		Lucky Fourteen Mining Co., c/o E. E. Ryan, Seey, 5525 Vallejo St., Emeryville	16	4	16
Lucky Spot		Joe Martin, Bagby	14	4	17
Manzanita		A. R. Jeffrey and Jack Pendray, Coulterville			
Margaret		See Buffalo Bill.	3	17	
Marie, Eagle Peak		E. E. Robertson, Jerseydale			
Mariposa, Las Palomas		N. Sanchez, Hornitos	4	19	
Mary Bess, Avarite		W. P. Hofstetter, R.F.D. A, box 214, Los Gatos	4	16	
McKinley		See Franklin.	29	4	

Meadow, Old Home-----	E. F. Fraser and M. E. McLean, Coulterville-----	3	18
Milburn-----	Mrs. Lucy J. Milburn, Mariposa-----	3	18
Mildred-----	W. M. Frew, Jerseydale-----	3	19
Milo-----	Wm. E. Frops-----	6	3
Mystery, Squaw Flat-----	Chas. A. Strandt, Coulterville-----	3	17
Mohawk, Mohawk No. 2, Tuxedo-----	D. G. Kidder, Coulterville-----	3	17
Monte Cristo, Excelsior-----	F. M. Skelton, Jerseydale-----	20	3
Mt. Gains group of 15 claims-----	Mt. Gains Mining and Milling Co., c/o Glenn C. Williams, R.F.D. 1, box 291, Bellflower-----	35	4
Mt. Queen-----	Est. of Geo. Shimer, c/o C. V. Ellis, Yosemitie-----	29	4
Mt. Queen, Sunset-----	Chas. E. Paine, Mariposa-----	29	4
N			
Nelly Bly-----	See Caldwell.		
Nevills Mining Co., 2/o J. J. Nevills, 465 California St., San Francisco-----	23	3	17
New Discovery, Buzzard, Dreadnaught, Star King-----	Robert B. Kennedy, 74 3d St., San Francisco-----	2	19
New York-----	See Iowa.		
Night Hawk-----	See Stepping Stones.		
North Star, Oro Grande-----	Nick Mullins and Max Jones, Mariposa-----		
Nugget, Yellow Kid-----	J. E. Duprey et al., Madera-----		
Number Five, Number Five Ext.-----	Milton Sutherland, Hornitos-----	11	5
O			
Occidental, Superb No. 1 and No. 2, Alder Trail No. 1	Thornton Jackson-----	34	4
and No. 2, Saddle Gas No. 1 and No. 2	George Odell, Bagby-----	2	5
Odel group of 7 claims-----	Geo. Lydiksen, 1616 23rd Ave., Oakland-----	14	4
Odin, Blue Jay-----	See Cincinnati.	36	3
Ohio Placer (P), Johnnie F.-----	Mrs. Jennie E. Diven, 147 Kempton Ave., Oakland-----	29	4
Old Home-----	See Meadow.		
Old Keok-----	Lizzie J. Bothager and Lester V. Dunlap, 823 E. Anderson St., Stockton-----	15	4
Old Timbers Club-----	Foresta Hodson, Jerseydale.		
Oochum-----	Guy E. Quick, Ben Hur-----		
Opalino, Keystone (L), Carmencita, Bonita, Lone Star-----	J. C. McManahan, Hotel Spokane, 248½ E. 5th St., Los Angeles-----	29	4
Oro Fino-----	See Eureka.		
Oro Grande-----	See North Star.		
Our Chance-----	L. F. Austin, Mt. Bullion-----		
Oversight-----	See Shallkey.		
P			
Patricia-----	Annie P. Brinham, Big Oak Flat-----	35	3
Patricia-----	See Charles.		
Penobscot, Crystall-----	D. J. Stollery, Trustee, c/o A. H. Elftman, 704 De Young Bldg., San Francisco-----	35	4

LIST OF UNPATENTED MINING CLAIMS SHOWING TO WHOM ASSESSED, FROM COUNTY ASSESSOR'S ROLLS—Continued.

Year March, 1926, to March, 1927.

Name	Lode or placer	Owner	Location		
			Sec.	T.	R.
Permit	See Boulder.				
Phoenix, Belle View	C. F. Lewis, Mariposa		20	4	18
Piedmont No. 1	R. H. Brotherton, 564 Market St., San Francisco				
Fine Lodge	W. W. Ferguson, Turlock				
Pioneer, Argos	Walter D. McLean, Coulterville		16	2	17
Pioneer, Talk	L. F. W. Busch, Mariposa		28	4	18
Platinum King, Platinum Queen, Inspiration	C. F. Kingery, Merced		31	3	17
Prince, Rose Gold, Golden Reward, Father	J. S. Wallace, 718 Washington Bldg., Los Angeles				
Princess	James Tresidder, 908 55th st., Oakland		32	4	18
Pyrophyllite	See Hard Luck.				
Quartz King	Q				
Queen Saxon	See Fremont Trail				
Rainbows End, King Midas	See King Saxon				
Raven	R				
Recorder, Rex, Cherry Tree	Pearl I. Werly, Mist		4	20	
Red Bank	See Tomboy.				
Red Garnett, Red Garnett South Ext.	Robert McLean, Mariposa		20	4	18
Red Hill	Wm. Arthur and Dareid Oneto, Hornitos		20	5	16
Regina Oaks	See Gold Run		21	3	19
Reina De Los Mariposas, Big Bull Shoot, Buck, Snapp	J. R. Feliz, c/o F. Ruiz, Mariposa		31	4	19
Reking	John D. Moore, Bagby		32	3	18
Review	Ludwig Rosenheimer, Bagby		14	4	17
Rex	See Garfield.				
Riverview	See Chucaloda.				
Roamer	Louis Milani, Coulterville				
Robbin	L. R. Johnson et al., Box 882, Merced		3	16	
Robin, Badger, Unnamed	Francis A. Cavignaro, Hornitos				
Rose Gold	See Prince.				
Saddle Gap	S				
San Domingo Annex	See Occidental.				
Sandy Bar	W. S. Zeller, 949 Excelsior Ave., Oakland				
	See Big Oak				

Scandinavian.....	O. Carlson, Buck Meadows.....	2	17
Sebastopol.....	L. L. Hart, Mariposa.....	5	19
Seventy Seven Minerals.....	See Doctor.		
Shallay, Bonanza (L), Gold Road, Chance, Oversight.....	Mrs. Annie A. Scanlon, 601 41st Ave., San Francisco.....	7	3
Checkmate.....	See Washington.		
Sharlee.....	A. R. & A. B. Shipperty & E. F. Lothrop, 830 State Life Bdg., Indianapolis, Indiana.....	19	19
Shippery group of 8 claims.....	Wm. McNally, Mariposa.....	3, 4	6
Silver Lead.....	Wm. McNally, Mariposa.....	3, 4	6
Simeon Landrum.....	Harry I. Maddox, Box 402, Merced.....	34	4
Sixteen to One.....	See Hidden Treasure.		
Shapp.....	See Reina De Las Mariposas.		
South Cranberry, South Cranberry Ext.....	Helen Bass, 2801 Union St., San Francisco.....	22	3
Spancler.....	Mrs. M. F. Spear and McIver, Box 128, Merced Falls.....	2	5
Spread Eagle group of 6 claims.....	Nick Mullins, Mariposa.....	32	4
Squaw Flat.....	See Mystery.		
Star (L), Stephen.....	Oro Rico Mines Co., c/o A. E. Towers, Metropolitan Club, New York.....	20	2
Star King.....	See New Discovery.		
Starlight.....	See Independence.		
Stepping Stones, Night Hawk, Fool's Choice, Elizabeth.....	Jackson Lawrence, Mariposa.....	30	5
St. Gabriel.....	A. J. Sanchez et al., 430 15th St., Merced.....	5	5
St. Paul.....	A. T. Alarid et al., 319 Heller St., Redwood City.....	33	5
Stud Horse Flat group, 5 claims.....	J. C. Straub, Madera.....	5	19
Sulphurets, Argonaut (L), Democrat, Spring, Columbia.....	J. P. Carroll, Bodega.....	35	3
Sultans, Bald Eagle.....	Quartzburg Mining Co., 615 Washington Ave., Point Richmond.....	32	4
Sultana Ext.	Bains and Tresidder, Mariposa.....	32	4
Summit.....	W. T. Rhodes, Clearinghouse.....		
Sunset, Venus, La Mariposa.....	John L. Dexter et al., Mariposa.....		
Sunset.....	Thos. Trujillo, Hornitos.....		
Superb.....	See Mt. Queen.		
Surprise.....	See Occidental.		
Sweetwater Mine 10 claims.....	See Lucky.		
	L. C. A. McCartney, Jerseydale.....	17, 20	4
Talc, Talc Extension.....	Herbert Shaw, Sonora.....	32	3
Talk.....	See Pioneer.	13	4
Telegraph Mt. No. 1 to No. 5.....	F. B. House, 383 Ocean View Ave., Santa Cruz.....	13	4
Thelema.....	See Buffalo Bill.		
Thelmas.....	See Big Oak.		
Tom and Mary.....	Irene Marcelli and Chas. E. Sites, Modesto.....		
Tombboy, Bald Eagle, Raven, Donald Mae.....	Thos. Rogers and Mrs. A. A. Peterson, c/o Thos. Rogers, Mariposa.....		
Tozier.....	See Landrum.		
Triumph.....	Est. of Jos. Helm, c/o J. M. Helm, Le Grand.....		

LIST OF UNPATENTED MINING CLAIMS SHOWING TO WHOM ASSESSED, FROM COUNTY ASSESSOR'S ROLLS—Continued.

Year March, 1926, to March, 1927.

Name	Lode or placer	Owner	Location		
			Sec.	T.	R.
Tunnel		See Garfield.			
Tuxedo		See Mohawk.			
Two Brothers		See Doctor.			
Uncle Jim Mine, 8 claims		U Wm. H. Rykert, 778 Ruthupham Ave., Ross Hill Station, Los Angeles-----	20, 29	3	19
Union, Summit		T. J. Ferguson, Jerseydale -----	30	4	19
Union Leader group		W. W. Hilliard, Coulterville -----		2	19
Unnamed		See Robin.			
Upper Willow No. 2	P	Malissa Clayton, R.F.D. 1, box 209, Selma -----	19	4	18
Venus		V See Sunset.			
Washington, Sharlee		W Washington Mines Syndicate Co., c/o Frank Bossman, 6422 Fountain Ave., Hollywood, or Leon J. Bogy, 2825 Ocean Front, Ocean Park-----	28	4	18
Washington		See Yosemite Railroad.			
Water Lily		Harry L. Frisbie et al., 1461 Stannage Ave., Berkeley -----	22	3	19
West Ruthford (I), West Ruthford Ext.	L	F. E. Bass, 2801 Union St., San Francisco -----	18	3	19
White Oak		A. B. Smith and W. J. Scofield, 55 5th St., San Francisco -----			
White Rock		Angels Gabrina, Coulterville.			
Willow	P	J. W. Myers and Malisse Clayton, R.F.D. 1, box 209, Selma -----	20	4	18
Winner		Mrs. Elsie R. Devidio, Mariposa -----	21, 28	4	18
Yellow Jacket		Y Eugene Lutz, Hornitos -----	25	4	16
Yellow Kid		See Nugget.			
Yellow Metal group		Yellow Metal Mining Co., 40th and Hollis Sts., Emeryville -----	17	4	18
Yellow Pine		See Black Sam.			
Yosemite Gold		See Doctor.			
Yosemite Railroad (P), Washington		Thos. M. Julian et al., c/o D. B., 1546 Fruitvale Ave., Oakland -----	5	4	17

LIST OF UNPATENTED MINING CLAIMS AND NAME OF OWNER, FROM COUNTY ASSESSOR'S RECORDS, MARCH 1 TO OCTOBER 1, 1927

SAN FRANCISCO FIELD DIVISION

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Name	Owner	Location		
		Sec.	T.	R.
A				
Albany Lode, Liberty Lode	Wm. H. Ryker and Anna Bingham, 778 Ruthupham Ave., Ross Hill Station, Los Angeles	29	3	19
Alena Belle, Blue Quartz, Luckie Lindie, Grain Gold, Mable	Belle McCord Roberts, Long Beach			
Alice L. Quartz, Good Luck G. Quartz, Hard Luck B. Quartz, Sunset F. Placer	Edward M. Roller	36	3	17
Alma Quartz	G. C. Brammer	21	3	19
B				
Banner Group	Geo. K. Allen, 328 Olive Ave., Piedmont	30	31	4
Belle View Ext.	John A. Schroeder, Mariposa	32	4	18
Berkeley	Alvin C. Wingard			
Bertram Farber	See Pauline Farber			
Bessie I.	W. H. Foster, Biggy			
Big Bill	W. L. Clairborne, P. A. Garage, 20th and Bush Sts., San Francisco			
Billings	O. B. Evans, Hornitos			
Black Jack	D. W. Strickland, Jerseydale; E. E. Case et al.			
Blue Quartz	See Alana Belle			
Bonanza	John McCann, Mariposa			
Bonanza	See Bull Dog			
Bonanza Quartz	John McCann and Lee Lemaster, Mariposa			
Bridge Placer	Mrs. J. P. Hearn, Babby			
Bright Hope	R. W. Davis, Mt. Bullion			
Bull Dog, Banana Bug, Mammoth, Bonanza, Jumper, Sunset, Columbia, Eureka	Frank J. Bruschi, Coulterville			
Bull Frog Quartz	See Mexican Quartz			
Burnite	J. M. Rowland, Cathay			
C				
Carmel Placer	George G. Gage, El Portal			
Carrie K.	See Sunrise Placer			
Challenge, Pine Crest, Pine Crest Ext.	W. P. Galic, Hornitos			
Chesterfield Quartz	Geo. Walker, Mariposa			
Columbia	See Bull Dog			
Copper King	See Kamper Quartz			

LIST OF UNPATENTED MINING CLAIMS AND NAME OF OWNER, FROM COUNTY ASSESSOR'S RECORDS, MARCH 1 TO OCTOBER 1, 1927—Continued.

Name	Owner	Location		
		Sec.	T.	R.
Dixie Quartz—Dooley Placer	G. L. Oldham and R. McLean, Mariposa Chas. Schindler, Bagby D	27	4	18
Ethel May Quartz	Jas. Vincent Lloyd, Bagby E	11	4	17
Eureka	See Bull Dog.		3	20
Eureka No. 2	L. C. Johnson F			
February E.	See Sunrise Placer.			
Good Luck G.	See Alice L. Quartz.			
Gopher C. Quartz, Ratlesnake N.	Ernest Chrestenson, El Portal G			
Grain Gold	See Alena Belle.			
Grand View...	Silvan J. Press, Bagby	36	3	16
Hard Luck B.	See Alice L. Quartz.			
Hazel Quartz	W. B. Mahoney, 122 10th St., Modesto			
Hope So. Sebastopol Ext.	H. Harrison, J. B. Annear and A. G. Lane, Mariposa			
Hudson Lode	W. H. Rykert and Ellen Elmer, 778 Ruthupham Ave., Ross Hill Station, Los Angeles	20	3	19
Johnnie Green, Jr.	C. A. Robinson, Merced J			
Jumper	See Bull Dog.			
Kemper Quartz, Copper King	R. T. Kemper, Bagby K	14	4	17
Lafayette Quartz, Lafayette Ext.	C. A. Quirolo, Hornitos L	5, 6	4	16
Last Chance	Mattie Brown, Coulterville		3	17
Lena Farber	See Pauline Farber.			
Liberty Lode	See Albany Lode.			
Lizzie No. 1, 2 and 3	Peter B. Johan			3

Lone Peak	Glenn A. Wallerstedt, Indian Peak or Mist.	4	18
Lone Pine	J. M. Elam and Nick Mullins, Mariposa	3	18
Lone Pine Quartz	J. M. Elam, Mariposa		
Lucky Judd Quartz	C. H. Harlan, Kinsley or Coulterville		
Luckie Lindie	See Alena Belle.	M	
Make No Mistake	See Sunnyside Quartz.		
Mammoth	See Bull Dog.		
Marble	See Alena Belle.		
Margarita James Quartz	Alan and Robt. Stout, Box 982, Merced	12	19
Marshall Quartz	M. L. Black, Hornitos	17, 18	4
Mexican Quartz, Bull Frog Quartz	Lee M. Sanchez, Hornitos	4	16
Midray Quartz	See Sunnyside Quartz.		
Mistake Placer	G. D. Winder	26	3
Mistletoe, Niggertoe	Milo J. Caton, 549 23d st., Merced	6	3
Morning Sun	Frank A. Howarth and John R. Rolland, Coulterville		17
Mt. Climb	Sam M. Bogdonovich, Mist.		
Niggertoe	See Mistletoe.	N	
Nightingale Quartz	Cora B. Johnson, Modesto		
Nola Placer	B. H. Boone, Clearinghouse	24	3
Nugget Placer	Edna H. Peterson, Hornitos		
Oak Flat Placer	Harry Barrett and Albert Cline, Hornitos	O	
Oat Hill and Oat Hill Ext. Placer	Wm. Erler, Merced Falls		
Oney Ext.	Eldridge D. Barrett, Coulterville		4
Pauline Farber, Lena Farber, Bertram Farber, Sunset Lode	United Building and Development Co., Golden Gate Theater Bldg., San Francisco	P	16
Pearl	Grace Coleman, Incline		
Pershing, Specimen	Eli J. Maria et al., Coulterville		13
Pine Crest	See Challenge.		3
Placer	E. T. Autrand and Geo. E. Trumble, Bagby		19
Rattlesnake N.	See Gopher C. Quartz.	R	
Red Jasper Placer	David R. Griffith, Merced		3
Riverside Quartz	See Sunnyside Quartz.	S	16
Sebastopol Ext.	See Hope So.		
Snake Cabin	Nicholas Albaard, Mt. Buck		4
Shamrock Placer	Geo. McDaniel, Mariposa		5

LIST OF UNPATENTED MINING CLAIMS AND NAME OF OWNER, FROM COUNTY ASSESSOR'S RECORDS, MARCH 1 TO OCTOBER 1, 1927—Continued.

Name	Owner	Location		
		Sec.	T.	R.
Silano No. 1 and 2, Victor Quartz— Silver Bar No. 2, 3, 4 Specimen—	Jean Poussou, Mariposa— Susan McNally, Mariposa— See Gopher C. Quartz.	9	4	18 16
Sunnyside Quartz, Midway Quartz, Riverside Quartz, Make No Mistake, Siempre-Viva Placer—	J. C. Krohn, d/o Chas. Arkell, Mariposa. See Sunnyside Quartz.	—	3	19
Siempre-Viva Placer—	Mrs. Alice Chrestenson, El Portal.—	—	3	20
Sunrise Placer, Carrie K. Quartz, February E. Quartz, Sunset—	See Bull Dog. See Alice L. Quartz. See Pauline Farber.	—	—	—
Sunset F. Placer—	Thos. L. Fay, Merced Falls	—	—	—
Sunset Lode—	I. N. Brothers, 122 10th St., Modesto Wm. H. Rykert and Geo. E. Howe, 778 Ruthupham Ave., Ross Hill Station, Los Angeles.—	20	3	19
Tar Lode—	U	—	3	20
Three Oaks—	Ross W. Cobb, Clearinghouse—	—	—	—
Troy Lode—	C. C. McVey, Bagby Fred T. Smith, Mariposa— Margarite Allen, Mariposa—	—	—	—
Una Placer, Unab Quartz, Unac Quartz, Unaf Quartz Unnamed—	See Silano.	V	—	—
Unnamed—	—	—	—	—
Victor Quartz—	W	—	—	—
W. and H. Quartz—	John Wildy and M. T. Hennessy, Jerseydale— Harry Kannen and H. L. Fishie, Coulterville— Paul A. Schulz, Bagby— Belle McCord Roberts, Long Beach—	12	4	17 18
Water Lily—	—	—	—	—
White Iron group of 13 claims—	—	—	—	—
White Oak—	—	—	—	—

Development consists of a 230-ft. shaft with two levels. On the 100-ft. level there are drifts 160' east and 65' west; on the 200-ft. level drifts 60' east and 60' west.

The old mill contained a 6-foot Marathon mill, 5-foot Huntington mill and two concentrating tables, all driven by a 40-h.p. Union gas engine. Former operators failed to save the values in the ore with this equipment and most of the production to date has come from selected high-grade ore which was shipped. Water is scarce except in winter. The present operators propose to put in a flotation system which it is believed will solve the metallurgical problem and make it possible to recover all of the values in the form of bullion at the mine. Part of the old equipment will be used in construction of the new treatment plant.

There is a parallel vein, about one-half mile south of the Silver Bar Mine, which has been developed on the *Wallman Ranch Property* to a depth of 280 feet by shaft. The 190-ft. level is drifted east for 92 feet. The ore here is similar to that of the Silver Bar, carrying a little gold associated with argenteite, ruby silver and other antimonial and arsenical silver sulphides. It is probable that this ore will be milled at the Silver Bar plant when in operation if the proposed treatment proves successful in recovering the values.

Wallman Ranch Property. (See Silver Bar Mine.)

ZINC

A deposit of triboluminescent zinc blende mixed with barite and gray tetrahedrite, the ore resembling a dark gray schist, is found in Secs. 9 and 10, T. 4 S., R. 15 E. The sphalerite (blende) emits a peculiar streak of light when scratched or rubbed in the dark with a knife or piece of steel. Some quartz possesses this same property of emitting light.

The Asposozien Company, care of F. V. Keesling, 1205 De Young Building, San Francisco, owns 80 acres of land covering the deposit. The material was at one time ground and sold under the name of 'Akoz' as a remedy for various ailments on the assumption that it contained radium.

It is stated that the ore carries 40% zinc. It has been idle for the past 10 or 15 years.

NONMETALLICS

The first commercial production of a nonmetallic mineral in Mariposa County was in 1899, when 110 squares of slate were marketed. Miscellaneous stone, barytes, marble, jasper and limestone have since been added to the commercial list. In 1926 the value of the nonmetallics, not including limestone, amounted to 42 per cent of the value of all minerals produced. The limestone quarry of the Yosemite Portland Cement Company was placed on an operating basis in 1927 and it is probable that beginning in 1927 the output of nonmetallics will exceed the metals in value, unless there is a sharp increase in metal mining.

Mariposa County contains deposits of many nonmetallic minerals, but it should be remembered that the marketing of most of these minerals is on an intensely competitive basis. They must compete in

quality and prices with the same products, imported and domestic, and also with substitutes, as for instance, asbestos shingles versus wood, and gypsum board versus celotex, a vegetable product. It will be seen that the mine owner has to meet well-organized competition and a thorough investigation should be made not only as to the deposits themselves, but also of market standardization requirements, beneficiation necessary, freight rates and other factors, before large expenditures are made in attempting to exploit these minerals, or losses will result.

ASBESTOS

Amphibole asbestos has been found in the serpentine areas along the Mother Lode at a number of places and small veins of chrysotile also occur in serpentine near Mariposa. None of these deposits have been developed, and their commercial value is problematical. E. L. Camin of Mariposa is reported to have a deposit near Mariposa.

BARITE

Egenhoff Barite Deposit. This deposit, which was discovered in 1917, is situated in Sec. 17, T. 4 S., R. 20 E., about five miles by trail from Jerseydale and six miles in an airline south of Yosemite Valley Railroad at its nearest point. Owner, W. D. Egenhoff, 85 Second street, San Francisco.

There are three claims with a total area of 60 acres. They lie at an elevation of 5000 feet and the surrounding country is mountainous. Water is obtained from springs and scattered timber covers the claims. The barite is fine-grained and white. It occurs in ledge form, with a slight dip to the east and strike a little west of north, between a hanging wall of limestone and footwall of quartzite. During 1927 a camp was constructed, the ledge traced for 4500 feet or more in length and prospected by several crosscuts, but so far its size has not been fully determined. Transportation would probably have to be provided by aerial tram to the railroad or by a branch rail line up the South Fork of Merced River, should the deposit warrant it.

Yosemite Barium Company. This company, a close organization in course of incorporation, with R. A. Fredericks as manager, is operating the barite deposit near El Portal, formerly worked at different periods by *El Portal Mining Co.* and *Western Rock Products Co.*, of San Francisco. Home office, Box 97, Merced; mine address, El Portal.

The deposit is located on Merced River one mile west of El Portal in Secs. 18 and 19, T. 3 S., R. 20 E. The river canyon cuts directly across the barite lode, and Yosemite Valley Railroad and the new Yosemite highway likewise cross the deposit. Elevation at the workings is 2000 feet, but the canyon sides rise steeply on the north and south to much higher elevations. Barite was discovered here on the north side of the river in the 80's, and former mining activities were on that side. In March, 1927, development of the deposit south of the river was begun and the present output is now coming from these new workings. The barite is mined by drifting and stoping. There are two adits run on the vein, the face of the upper one being 80 feet below the surface. This level is being stoped. The second adit is 180 feet below the upper. The workings show the lode to be irregular, the

vein swelling into a series of lenses, one large one now opened up being estimated to contain several hundred thousand tons of barite. The average width of the main vein is 14 feet, and the maximum width so far developed, 35 feet. There is also a smaller parallel vein from which some production has been made. The company controls 500 acres of land on which the deposit occurs. The barite is shipped crude, as mined, the present output being about 75 tons per day, the crude



Loading bunker at Yosemite Barium Company's Mine,
near El Portal, Mariposa County.

material averaging 94% BaSO_4 . Some witherite (BaCO_3) is associated with the barite in places, but it is not being mined.

Equipment at the property includes a 50-h.p. Diesel engine, compressor, air drills, track, cars, etc. A cable way is being constructed to transport the material across the river to bunkers on the railroad. The barite is loaded from a chute to auto trucks and hauled to El Portal for shipment while this is being completed. Sixteen men are employed.

FELDSPAR

Feldspar occurs as a constituent of the granites and other rocks in Yosemite Valley and it has been noted near Coulterville, but the first reported discovery of what is apparently a commercial deposit of potash feldspar has just been made (December, 1927). This discovery became known subsequent to the present survey and the deposit has not as yet been visited by a representative of the Division of Mines and Mining.

Hamilton Feldspar Deposit. This deposit is on the old Joseph Carmichael ranch in Sec. 30, T. 5 S., R. 17 E., now owned by Matthew Hamilton, c/o Stockton Record, Stockton, California, and other members of the Hamilton family. It is located seven miles easterly from Hornitos, or 15 miles from Yosemite Valley Railroad at Merced Falls. The elevation is 1350 feet; surface, rolling hills. Bear Creek and Corbett Creek flow through the property, which comprises 485 acres of patented land. The holdings have been used as a cattle range and there is no equipment. There are three known ledges and several massive deposits reported. One ledge is stated to have been traced for nearly a mile, apparently following a large bull quartz vein. According to the owner, the outcrop varies from a few feet to over 300 feet in width, as well as containing several blowouts, indicating quarry possibilities. As yet, no development work has been done. A sample from the outcrop submitted to the laboratory proved to be orthoclase (potash) feldspar, with a small amount of iron oxide present.

GARNET

A well-defined dike of garnet-bearing rock has been traced for several miles striking in a north-south direction across the southeastern end of Guadalupe Mountains. It outcrops plainly about two miles from Bridgeport where the dike crosses China Creek. In places on the property of Wm. Wass (P. O. address, Cathay), in Secs. 21 and 22, T. 6 S., R. 18 E., the dike rock is thickly studded with garnets of the grossularite variety, ranging in diameter from $\frac{1}{4}$ to $\frac{3}{4}$ inch. No garnets of gem value were seen, but they could no doubt be utilized in the manufacture of garnet paper and cloth, or as garnet sand for abrasive purposes.

Massive brown almandite garnet also occurs on Mt. Hoffman, but the location of this deposit within Yosemite National Park precludes its being worked.

GRANITE

The granite resources of Mariposa County are unlimited in extent and of practically all textures; much of it no doubt equal to that being quarried at Raymond, Madera County. The National Park Service has utilized considerable of the granite and grano-diorite in Yosemite Valley in local construction work and road building, operating a quarry and crushing plant as occasion requires.

At the base of Big Spring Hill, in Sec. 30, T. 5 S., R. 19 E., three miles east of Mariposa and adjacent to the Mariposa-Bootjack road, there is a ledge of white aplite 30 to 40 feet wide, which would make an excellent building stone. Aplite is a white micaless granite. Apparently a little of this rock was quarried years ago.

JASPER ROCK

Jasper Rock Quarries. (Formerly Merced Stone Quarries.) This property consists of 60 acres of patented land, situated on the north side of Merced River on Yosemite Valley Railroad, at Jasper station in Sec. 19, T. 3 S., R. 16 E. Elevation, 800 feet. A crushing plant was at one time operated here by E. B. and A. L. Stone Co. of San Francisco, and the rock sold as ordinary ballast. In 1927 the quarry was acquired by H. J. Kelm of Bagby, who recognized the value of the rock for special use in the building industry in the manufacture of composition roofing and shingles, and as surfacing granules. He reopened the quarry under the name of Jasper Rock Quarries, and is now producing variously colored jasper rock for special uses at the rate of 40 tons per day. Address, Jasper Rock Quarries, H. J. Kelm, owner, Bagby, California.

The deposit consists of highly silicified sedimentary formations. They dip about 45° W. and have been opened up across the face for 900 feet. In the eastern end of the quarry the jasper is green in color, but toward the western end, red, brown, purple, green and variegated colors occur. Strata heavily impregnated with manganese occur in the footwall and some chimneys of manganese are found. At present the output is shipped as quarry run, all crushing being done at the manufacturing plants. The quarry is worked by open cut, the face standing 120 to 150 feet in height. Equipment includes one 20-h.p. and one 7-h.p. gas engine for operating, compressor and hoist; air drills, 1000 feet of track, mine cars and boarding house. Ten men are employed.

H. P. Varain of La Grange has submitted a sample of red jasper said to have come from a large ledge on the north side of Merced River, one mile from Yosemite Valley Railroad line, Mariposa County.

LIMESTONE AND MARBLE

Large deposits of limestone and marble are among the important mineral resources of this county. Their existence has been known for many years, but there was little or no commercial output until 1927. The principal occurrences are: near Exchequer dam on the east side of Lake McClure in Sec. 18, T. 4 S., R. 16 E.; in the limestone belt which extends in a southeasterly direction through Bower Cave, 12 miles east of Coulterville to Jenkins Hill on Merced River, where it is now being quarried on a large scale; and at Marble Point near Hites Cave on the South Fork Merced River.

The latter deposit is in Sec. 2, T. 4 S., R. 19 E., and is owned by F. A. Bondshu, J. F. Harris, C. P. Pratt and J. W. Pratt of Mariposa. This material is a fine variegated marble, white with dark blue streaks through it, and takes a high polish. The deposit is approximately 3000 feet in width here and stands 600 feet above the river, but its location is not easily accessible.

Limestone occurs also at El Portal, and in T. 4 S., R. 20 E., five miles east of Jerseydale, in the same belt in which barite is found.

Yosemite Portland Cement Corporation (Emory Quarry). This company, which began the manufacture of portland cement at their plant in Merced in 1927, owns and operates a very large high-grade limestone quarry, known as Emory Quarry, in Mariposa County. A.

Emory Wishon, president; Murray Bourne, secretary; home office, Merced; Burt Hannigan, quarry superintendent, Emory Station.

The quarry property is located at Jenkins Hill on the north side of Merced River, 11 miles below El Portal in Secs. 7 and 8, T. 3 S., R. 19 E., and contains 700 acres. Yosemite Valley Railroad, which crosses the property, provides direct rail transportation to the Merced plant. Elevation at the railroad, 1340 feet.

The limestone outcrops prominently and has no overburden. It trends north and dips about 85° E. The rock is somewhat dark in color due to the presence of 1½% of carbonaceous matter, but this is eliminated in burning and does not affect the whiteness of the finished cement.

During 1927 operations progressed from the development stage to an operating status, regular shipments of limestone beginning in September. A working face has been opened up 800 feet above the railroad level. At present the face is 30 feet high and 375 feet long. It will eventually extend the whole length of the deposit. From this floor the face can still be carried 500 feet higher. In mining, jackhammer drills are used, both lifter and top holes being put in. After blasting, the broken rock is loaded with a Marion No. 32 electric shovel into 6-yard standard-gauge dump cars. These are hauled in trains by a Plymouth 14-ton gasoline locomotive 2000 feet to the crushing plant at the head of the incline tramway. The primary crusher is an Allis-Chalmers No. 15 gyratory. This is followed by a Williams Jumbo hammer-mill, which reduces the rock to a maximum of 1½-inch size. The crushed rock is then delivered by conveyor belt to a 600-ton storage bin. This upper bin is connected with the lower bunker at the railroad by a double track, balanced, incline tramway. There are two cars of 15-ton capacity, the loaded car pulling up the empty, with regenerative braking and automatic dumping arrangement at the lower bunkers. The latter hold 275 tons and discharge direct to railroad cars.

The quarry is electrically operated throughout the connected load being 850 horsepower, which is supplied by the San Joaquin Light and Power Company's lines. Good living quarters are provided and the boarding house is electrically equipped for cooking and refrigeration. Thirty-five men compose the regular quarry crew.

Bibl: Rock Products, June 11, 1927.

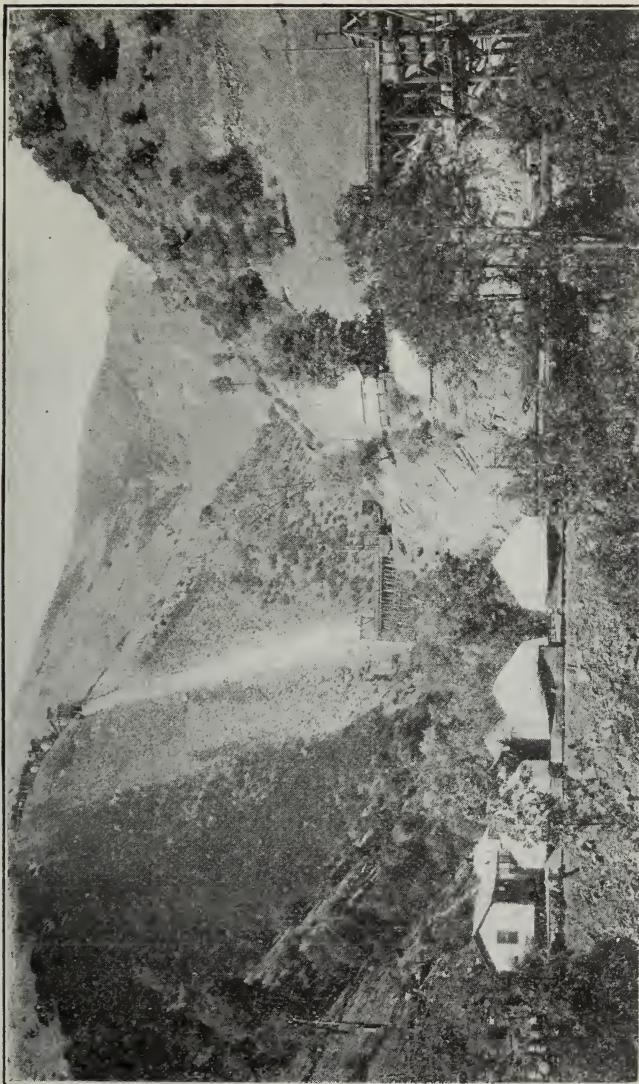
MAGNESITE

Several small veins of magnesite, up to two feet wide on the surface, outcrop on Big Spring Hill in Sec. 30, T. 5 S., R. 19 E., about three miles east of Mariposa. They have only been dug into a few feet. Considerable float is found in the vicinity. They are on the ranch of Erwin J. Ashworth of Mariposa.

Adjacent to the magnesite deposit in Sec. 30, T. 5 S., R. 19 E., there is a vein of soft white, compact amorphous silica, that was erroneously referred to in previous reports as meerschaum. It appears to be a spring deposit and is small in extent. It is on the Erwin J. Ashworth ranch.

MARIPOSITE

Beautiful mottled green and white Mariposite occurs at several localities along the Mother Lode in the county, notably near Coulterville. There is a possible market for limited quantities of this material for stucco 'dash' and as an ornamental stone.



Crushing plant, upper bunkers, tramway to lower bunkers and quarry face (at lowest point in sky-line); Emory Quarry, Yosemite Portland Cement Corporation, Mariposa County. Photo by R. L. Mook, during early stage of operation.

MICA-SCHIST

Mica-schist, talc-schist, amphibolite-schist, pyrophyllite and similar magnesium aluminum silicates are found at various points in the county as rock-forming minerals in the broad zone of Jurassic and Cretaceous rocks lying between the valley sediments and the granite batholith of the Sierra. Certain commercial uses have been developed in recent years for some of these schistose and talcose minerals and research work is continually adding to the number that may have a special industrial use. A large undeveloped deposit of pyrophyllite occurs at Three Buttes, about two miles southwest of Indian Gulch, in Sec. 9, T. 6 S., R. 16 E., that may eventually prove valuable.

ROCK CRYSTAL

Quartz crystals in considerable amount, some of good quality, but mostly of small size, have been found in many of the mines in Mariposa County. There has been no commercial output, although there is a market for rock crystal that meets certain specifications regarding size,



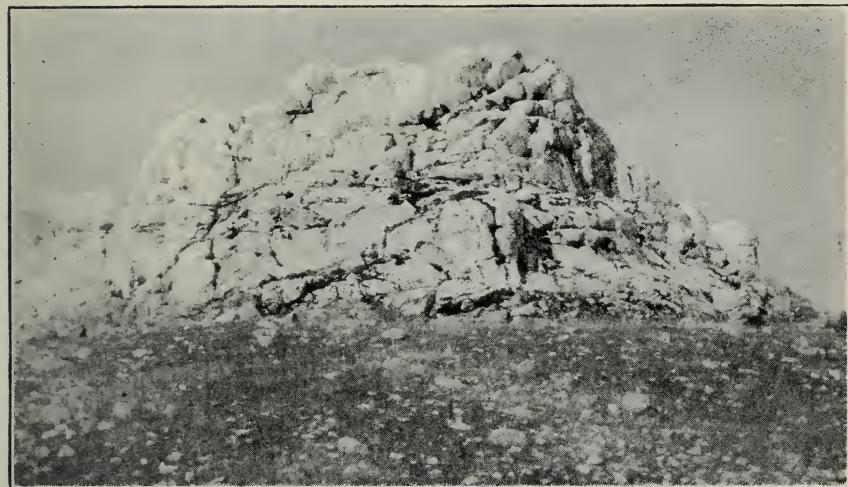
White Rock Silica (quartz) Deposit, near Lewis, Mariposa County.

clearness and freedom from flaws, for industrial uses and as a gem material. W. L. Apperson, Mariposa, has taken out several tons from his property.

SILICA

White Rock Silica Deposit is on patented land, owned by J. H. Helm and P. Carmean of Le Grand. The deposit consists of a massive outcrop of white glassy quartz, practically pure silica, but with occasional spots showing a little iron stain. The outcrop is on the top of a knoll at an elevation of 1117 feet and is a noted landmark for miles around, being visible from the valley highway. This massive vein occurs near the contact of slate on the west and a granite intrusion of almost circular form. One mile southeast of this exposure there is another similar outcrop, apparently on the same vein but somewhat smaller,

and several parallel veins of bull quartz, outcropping at intervals, are visible from White Rock deposit. Two carloads of silica were shipped to Los Angeles in 1926, but at the prevailing price it was found unprofitable. The cost of mining, 14-mile haul to the railroad at Le Grand and freight to Los Angeles left no surplus; but a slight reduction in transportation costs would permit operation. The amount of silica in sight has been variously estimated at one to three million tons. The old White Rock copper mine is only a few hundred yards distant.



Close-up view of White Rock Silica Deposit; a massive outcrop of practically pure quartz visible for miles, Mariposa County.

SLATE

Slate and schistose rocks are very abundant in the western half of the county, the Mariposa slates of the gold belt being one of the most prominent formations. Many of the old buildings now in ruins were constructed of these fissile rocks which were easily split and laid up in walls. Yosemite Valley Highway crosses the slate belt soon after leaving the valley floor. This belt extends along the southwestern side of the county its entire length. Several slate quarries have been opened up in the past, but there has been no production for about 20 years except a small tonnage from one of the dumps, which was shipped out in 1926 and crushed for roofing rock.

Cunningham Slate Quarry consists of slate land in Secs. 6, 7, 8 and 17, T. 7 S., R. 17 E., owned by Cunningham Corporation, Planada. This quarry was under lease for a period of 15 years and a considerable quantity of good roofing slate was produced when it was operated. Idle.

Pacific Slate Quarry comprises 50 acres situated in Sec. 6, T. 6 S., R. 16 E., four miles from Merced Falls; owned by Pacific Slate Company, Merced. Most of the slate produced here in the past was used for roofing purposes. Idle.

A good outcrop of slate is exposed on the south side of Merced River opposite and a little west of Bagby. Numerous outcrops occur on the ranch of Chase and Son, adjacent to Yosemite Valley Highway in T. 7 S., R. 16 E. It is also found on the Robert Prouty holdings in T. 4 S., R. 15 E., on the Muller Ranch near Hornitos and at many other points, but the quality that can be produced will remain undetermined until some development has been done.

SOAPSTONE AND TALC

Fairly extensive deposits of soapstone and talc occur along the Mother Lode. A large deposit of soapstone about 12 miles east of Coulterville was utilized in the early days, one of the large corner buildings in the town being constructed of sawed blocks of this stone. It has been used locally in fireplace construction.

Cuceo Talc Claim consists of one patented claim of 20 acres, situated in Sec. 19, T. 3 S., R. 17 E., in the Flyaway district.

Shaw Talc Claims. Herbert Shaw of Sonora has two claims, the Tale and Tale Extension, situated in Sec. 32, T. 3 S., R. 17 E., in the Flyaway district.

Yosemite Talc Mine comprises one claim at the lower end of Flyaway Gulch in Sec. 31, T. 3 S., R. 17 E., 1½ miles from Bagby; owner, T. B. Elliott, Box 1993, Angels Camp. This deposit is 75 feet wide and has been developed by open cuts and a 60-ft. shaft. The talc is white in color and contains no lime. An analysis gave the following results:

	Per cent
SiO ₂	61.0
Fe and Al ₂	2.5
MgO	32.55
H ₂ O	2.3
Undetermined	1.65
	<hr/> 100.00

Samples of foliated talc have been submitted by Charles E. Hill of Ben Hur or Usona. Henry Fick of Mariposa also has submitted talc samples. Talc has been noted as occurring on the property of Robert Prouty in Sec. 11, T. 4 S., R. 15 E., and there are numerous other unrecorded occurrences. Their commercial possibilities remain to be determined.

STONE (MISCELLANEOUS)

There are no commercial crushed rock, sand and gravel plants operating in the county. The National Park Service has a quarry, crushing and screening plant in Yosemite Valley, which is operated as occasion demands to supply crushed rock for road and other construction work carried on by the government.

During 1927 the State Highway Commission let a contract for the crushing of the Mariposa Mine dump near Mariposa and 38,000 tons of crushed rock was produced here for highway use.

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OIL FIELD DEVELOPMENT OPERATIONS

By R. D. BUSH, State Oil and Gas Supervisor.

From January 1, 1928, to and including March 31, 1928, the following new wells were reported as ready to drill:

Company	Sec.	Twp.	Range	Well No.	Field
ALAMEDA COUNTY:					
R. Y. Hanlon.....	3	5	1	1	
FRESNO COUNTY:					
Standard Oil Co.....	11	19	15	208	Coalinga
Zier Oil Co.....	1	20	14	27	Coalinga
KERN COUNTY:					
Berry Oil Co.....	30	28	21	25	Belridge
Berry Oil Co.....	30	28	21	29	Belridge
Berry Oil Co.....	30	28	21	44	Belridge
Associated Oil Co.....	23	28	27	2	Kern River
Associated Oil Co.....	23	28	27	3	Kern River
Associated Oil Co.....	23	28	27	4	Kern River
Associated Oil Co.....	23	28	27	6	Kern River
Associated Oil Co.....	23	28	27	44	Kern River
Associated Oil Co.....	23	28	27	53	Kern River
Associated Oil Co.....	23	28	27	54	Kern River
Bishop Corp.....	23	28	27	6	Kern River
Brownmoor Oil Co.....	16	28	27	Cauley 2	Kern River
Brownmoor Oil Co.....	16	28	27	Cauley 12-A	Kern River
California Petroleum Corp.....	26	28	27	Cole 2	Kern River
California Petroleum Corp.....	23	28	27	Lehmann 5	Kern River
California Star Oil Co.....	22	28	27	1-80	Kern River
California Star Oil Co.....	22	28	27	3-40	Kern River
California Star Oil Co.....	22	28	27	4-80	Kern River
Chanslor-Canfield Midway Oil Co.....	23	28	27	15	Kern River
Chanslor-Canfield Midway Oil Co.....	23	28	27	16	Kern River
Chanslor-Canfield Midway Oil Co.....	23	28	27	17	Kern River
Chanslor-Canfield Midway Oil Co.....	23	28	27	18	Kern River
Chanslor-Canfield Midway Oil Co.....	23	28	27	19	Kern River
Chanslor-Canfield Midway Oil Co.....	23	28	27	20	Kern River
Chanslor-Canfield Midway Oil Co.....	23	28	27	21	Kern River
General Petroleum Corp.....	14	28	27	19	Kern River
General Petroleum Corp.....	26	28	27	Sill 5	Kern River
General Petroleum Corp.....	26	28	27	Sill 6	Kern River
General Petroleum Corp.....	26	28	27	Sill 31	Kern River
General Petroleum Corp.....	26	28	27	Sill 32	Kern River
General Petroleum Corp.....	26	28	27	Wetmore 12	Kern River
General Petroleum Corp.....	14	28	27	Grady 6	Kern River
George F. Getty, Inc.....	26	28	27	McDougall 3	Kern River
George F. Getty, Inc.....	26	28	27	McDougall 4	Kern River
George F. Getty, Inc.....	26	28	27	McDougall 5	Kern River
George F. Getty, Inc.....	26	28	27	McDougall 6	Kern River
George F. Getty, Inc.....	26	28	27	McDougall 7	Kern River
The Kern River Oilfields of Cal., Ltd.....	26	28	27	5	Kern River
The Kern River Oilfields of Cal., Ltd.....	26	28	27	9	Kern River
Midland Oilfields Co., Ltd.....	14	28	27	1	Kern River
Midland Oilfields Co., Ltd.....	14	28	27	2	Kern River
Midland Oilfields Co., Ltd.....	14	28	27	3	Kern River
Midland Oilfields Co., Ltd.....	14	28	27	6	Kern River
Midland Oilfields Co., Ltd.....	14	28	27	9	Kern River
Midland Oilfields Co., Ltd.....	14	28	27	12	Kern River
Midland Oilfields Co., Ltd.....	14	28	27	13	Kern River
Midland Oilfields Co., Ltd.....	14	28	27	14	Kern River
Midland Oilfields Co., Ltd.....	14	28	27	15	Kern River
Petroleum Securities Co.....	22	28	27	10	Kern River
Petroleum Securities Co.....	22	28	27	11	Kern River
Petroleum Securities Co.....	22	28	27	12	Kern River
Petroleum Securities Co.....	22	28	27	13	Kern River
Petroleum Securities Co.....	22	28	27	14	Kern River

OIL FIELD DEVELOPMENT OPERATIONS—Continued

Company	Sec.	Twp.	Range	Well No.	Field
KERN COUNTY—Continued.					
Petroleum Securities Co.	22	28	27	15	Kern River
Standard Oil Co.	27	27	27	14	Kern River
Standard Oil Co.	15	28	27	21	Kern River
H. H. Bell	4	30	22	3	McKittrick
Franco-Western Oil Co.	8	30	22	9	McKittrick
Keefe-Morrison, Inc.	8	30	22	8	McKittrick
C. C. M. O. Co.	7	32	23	4	Midway
C. R. Craft	21	31	22	5	Midway
Honolulu Consolidated Oil Co.	6	32	24	79	Midway
Midland Oilfields Co., Ltd.	34	31	24		Thornber 2-A
North American Oil Consolidated	32	31	24		3-A
North American Oil Consolidated	32	31	24		7
North American Oil Consolidated	16	32	23		26
North American Oil Consolidated	32	31	24		29
Republic Petroleum Co.	7	32	23		Midway
Standard Oil Co.	3	32	24		45
Standard Oil Co.	29	31	24		52
Standard Oil Co.	19	31	24		84
Standard Oil Co.	19	31	24		85
Standard Oil Co.	29	31	24		85
Standard Oil Co.	33	31	24		92
Standard Oil Co.	33	31	24		99
Western Production Co.	21	31	22		Midway
Berry Oil Co.	25	27	28		Glide 1
California Petroleum Corp.	15	27	28		1
General Petroleum Corp.	21	27	28		Glide 21 7
General Petroleum Corp.	21	27	28		Glide 21 9
Modoc Petroleum Corp.	32	26	28		Kathryn Hyde 2
Shell Co.	1	27	27		Mt. Poso
Signal Gasoline Co., Inc.	27	27	28		Glide 3
Elbe Oil Land Development Co.	20	28	29		1
Elbe Oil Land Development Co.	20	28	29		11
Elbe Oil Land Development Co.	20	28	29		13
Shell Co.	29	28	29		94
Henry Robinett	2	29	20		Jewett 2
Standard Oil Co.	27	11	20		Round Mountain
Doheny Stone Drill Co.	21	26	22		Temblor
R. B. Jackson & C. H. Chamberlain	19	29	28		Kern Co. Lease
Milham Exploration Co.	8	28	23	No. 2	Wheeler Ridge
Milham Exploration Co.	5	28	23		Kerwin 1
North American Oil Cons.	5	25	26		1
J. E. O'Donnell	31	30	28		Kern 3
The Pacific Eastern Production Co.	6	30	28		Kern 4
The Pacific Eastern Production Co.	21	29	27		Wallace 1-A
The Pacific Eastern Production Co.	21	29	27		Houghton 1
Shell Co.	16	26	28		K. C. L. 2
Southern California Gas Co.	4	28	23		2-KCL-B
W. W. Stabler	23	32	29		3-KCL-B
Superior Oil Co.	24	29	29		Corral Canyon 1
Zurich Oil Co.	30	28	22		4-1
LOS ANGELES COUNTY:					
Union Oil Co.	33	3	13	Callender 22	Dominguez
Union Oil Co.	33	3	13	Callender 23	Dominguez
Union Oil Co.	33	3	13	Carson 4	Dominguez
Standard Oil Co.	8	2	14	Baldwin-Cienega	
Standard Oil Co.	8	2	14		38
Standard Oil Co.	17	2	14	Baldwin-Cienega	Inglewood
Bartholomae Oil Corp.	29	4	12	L. A. Inv. 1	47
Bolsa Chica Oil Corp.	30	4	12		Inglewood
Bush-Voorhis Oil Co.	20	4	12		5
California Petroleum Corp.	30	4	12		Long Beach
California Petroleum Corp.	19	4	12	Mutual 5	Long Beach
California Petroleum Corp.	19	4	12		23
California Petroleum Corp.	19	4	12	Crosswell 2	Long Beach
California Petroleum Corp.	19	4	12	Davidson 9	Long Beach
California Petroleum Corp.	19	4	12	Foster Two 4	Long Beach

OIL FIELD DEVELOPMENT OPERATIONS—Continued

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Cont.					
California Petroleum Corp.	20	4	12	Gray 3	Long Beach
J. H. Cochran	29	4	12	1	Long Beach
Dabney-Johnston Oil Corp.	30	4	12	7	Long Beach
Dabney-Johnston Oil Corp.	24	4	13	8	Long Beach
Dabney-Johnston Oil Corp.	29	4	12	9	Long Beach
Dabney-Johnston Oil Corp.	24	4	13	10	Long Beach
Delaney Petroleum Corp.	29	4	12	Community 1	Long Beach
L. T. Edwards	29	4	12	Long & Paulson 1	Long Beach
L. T. Edwards	29	4	12	Mickelson 1	Long Beach
Fred Fitch	29	4	12	Sievers 1	Long Beach
General Petroleum Corp.	19	4	12	K. & H. 9	Long Beach
George F. Getty, Inc.	29	4	12	L. B. 25	Long Beach
George F. Getty, Inc.	20	4	12	L. B. 27	Long Beach
George F. Getty, Inc. and J. Paul Getty	19	4	12	L. B. 23-A	Long Beach
George F. Getty, Inc. and J. Paul Getty	19	4	12	L. B. 26	Long Beach
Graham-Loftus Oil Co.	19	4	12	Acme 1	Long Beach
Graham-Loftus Oil Co.	19	4	12	Acme 2	Long Beach
Graham-Loftus Oil Co.	19	4	12	Acme 3	Long Beach
Greek-American Petroleum Corp.	29	4	12	1	Long Beach
Greek-American Petroleum Corp.	29	4	12	2	Long Beach
Hancock Oil Co.	19	4	12	Signal 7	Long Beach
Herndon Petroleum Corp.	29	4	12	Herndon 6	Long Beach
Herndon Petroleum Corp.	29	4	12	Herndon 7	Long Beach
Ideal Oil Co.	19	4	12	1	Long Beach
Thomas Kelly & Sons, Inc.	19	4	12	Kelly 2	Long Beach
Marine Corp.	29	4	12	61	Long Beach
Marine Corp.	19	4	12	62	Long Beach
Marine Corp.—Cal-Mex Oil & Refining Co.	19	4	12	26	Long Beach
Edwin T. Mattox	28	4	12	Mattox 1	Long Beach
McKeon Drilling Co., Inc.	28	4	12	Community 1	Long Beach
McKeon Drilling Co., Inc.	29	4	12	Conklin 1	Long Beach
McKeon Drilling Co., Inc.	29	4	12	Deeds 1	Long Beach
McKeon Drilling Co., Inc.	19	4	12	Knight 1	Long Beach
Miley Oil Co.	29	4	12	Miley-Signal 1	Long Beach
Miley Oil Co.	19	4	12	Miley-Signal 2	Long Beach
J. E. O'Donnell	29	4	12	O'Donnell 66	Long Beach
Painted Hills Oil Ass'n.	19	4	12	14	Long Beach
Pan American Petroleum Co.	29	4	12	Drake 1	Long Beach
Pan American Petroleum Co.	29	4	12	Pyle-Coffin 2	Long Beach
The Petroleum Co.	19	4	12	Rissman 3	Long Beach
Petroleum Exploration Co.	29	4	12	Prudential 1	Long Beach
Max Pray	19	4	12	1	Long Beach
Richfield Oil Co.	19	4	12	Augustine 2	Long Beach
Richfield Oil Co.	29	4	12	Booth 10	Long Beach
Richfield Oil Co.	29	4	12	Denni 7	Long Beach
Richfield Oil Co.	29	4	12	Fry 4	Long Beach
Richfield Oil Co.	19	4	12	Hoover 3	Long Beach
Richfield Oil Co.	29	4	12	Lekas 3	Long Beach
Richfield Oil Co.	19	4	12	Malcom-Davis 3	Long Beach
Richfield Oil Co.	19	4	12	R. C. 8	Long Beach
Richfield Oil Co.	20	4	12	Roco 1	Long Beach
Richfield Oil Co.	20	4	12	Scoco 1	Long Beach
Shell Co.	20	4	12	Andrews 6	Long Beach
Shell Co.	29	4	12	Binkley 4	Long Beach
Shell Co.	29	4	12	Brown 1	Long Beach
Shell Co.	29	4	12	Cherry Hill	Long Beach
Shell Co.	29	4	12	Comm. 6	Long Beach
Shell Co.	29	4	12	Church Comm. 2	Long Beach
Shell Co.	29	4	12	Coseboom 8	Long Beach
Shell Co.	29	4	12	Dobyns 5	Long Beach
Shell Co.	29	4	12	Foster Comm. 2	Long Beach
Shell Co.	29	4	12	Hamilton 3	Long Beach
Shell Co.	29	4	12	Horsch 3	Long Beach
Shell Co.	29	4	12	Jones Comm. 7	Long Beach
Shell Co.	29	4	12	Jones Comm. 8	Long Beach
Shell Co.	20	4	12	Marcellus 5	Long Beach
Shell Co.	29	4	12	Nicholson 5	Long Beach

OIL FIELD DEVELOPMENT OPERATIONS—Continued

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Cont.					
Shell Co.	29	4	12	Pala 2	Long Beach
Shell Co.	29	4	12	Patton-Wilson 6	Long Beach
Shell Co.	29	4	12	Patton-Wilson 7	Long Beach
Shell Co.	29	4	12	Pickler 7	Long Beach
Shell Co.	29	4	12	Pickler 8	Long Beach
Shell Co.	29	4	12	Wells 3	Long Beach
Shell Co.	29	4	12	Wells 4	Long Beach
Shell Co.	29	4	12	Wilbur 4	Long Beach
Signal Syndicate No. 4	30	4	12	8	Long Beach
South Basin Oil Co.	30	4	12	Nakamura 2	Long Beach
Travis Drilling Co.	19	4	12	Travis 3	Long Beach
Union Oil Co.	19	4	12	U. S. Royalties 1	Long Beach
Warren & Macrate	19	4	12	Neet 2	Long Beach
Wilshire Oil Co., Inc.	20	4	12	Wilshire Long Beach 1	Long Beach
Woolner Oil Corp.	19	4	12	Signal Hill 3	Long Beach
World Petroleum Corp.	33	4	12	Signal Hill 9	Long Beach
Associated Oil Co.	34	2	14	Cypress 2	Potrero
Petroleum Securities Co.	27	2	14	Connolly 1	Potrero
W. R. Preston	17	3	13	1	Rosarans
A. D. Kneuper	10	5	12	1	Seal Beach
Standard Oil Co.	3	5	12	San Gabriel 18	Seal Beach
C. C. M. O. Co.	15	4	14	Torrance 81	Torrance
Easton & Smith et al.	19	1	17	3	-----
D. H. Wood	5	7	10	1	-----
MONTEREY COUNTY:					
Marland Oil Co.	32	24	11	Nacimiento 1	-----
ORANGE COUNTY:					
Birch Oil Co.	2	3	10	15	Brea Olinda
Fullerton Oil Co.	2	3	10	23	Brea Olinda
California Petroleum Corp.	28	5	11	Buck 5	Huntington Beach
P. Campbell	10	6	11	1	Huntington Beach
Geo. E. Cloud	10	6	11	2	Huntington Beach
Globe Lease & Royalty Co.	27	5	11	4	Huntington Beach
Imperial Gypsum & Oil Corp.	34	5	11	2	Huntington Beach
John Morris	10	6	11	2	Huntington Beach
Paul & Collier	10	6	11	2	Huntington Beach
Southern California Drilling Co.	2	6	11	1	Huntington Beach
Standard Oil Co.	34	5	11	Bolsa 34	Huntington Beach
Standard Oil Co.	34	5	11	Bolsa 35	Huntington Beach
World Petroleum Corp.	10	6	11	10	Huntington Beach
Frank Buttram	36	3	9	Kraemer 2	Richfield
Continental Oil Co.	33	3	9	Muller 1	Richfield
Standard Oil Co.	34	3	9	Anaheim Union 4	Richfield
Union Oil Co.	29	3	9	Morse 8	Richfield
The Ohio Oil Co.	9	4	11	Geo. B. Miller 1	-----
Olympic Refining Co.	19	5	11	1	-----
SAN BENITO COUNTY:					
Betabel Fruit Farms	Sub. Ranc	B of ho San	Lot 6, Anto- nio	1-A	-----
Hamiltonian Oil Co.	19	16	11	2	-----
SAN BERNARDINO COUNTY:					
Del Rosa Oil and Gas Co.	13	1	4	2	-----
SAN MATEO COUNTY:					
Shell Co.	16	6	5	Butts 1	-----
SANTA BARBARA COUNTY:					
F. G. Delaney	30	9	32	1	Cat Canyon
Santa Barbara Oil Co.	3	4	29	Hollister 7-A	Goleta
Union Oil Co.	--	8	34	Purisima 19	Lompoc

OIL FIELD DEVELOPMENT OPERATIONS—Continued

Company	Sec.	Twp.	Range	Well No.	Field
VENTURA COUNTY:					
Triple A Investment Co.	5	3	19	1	Bardsdale
C. C. M. O. Co.	8	3	24	Hobson B-2	Rincon
C. C. M. O. Co.	8	3	24	Hobson C-5	Rincon
General Petroleum Corp.	8	3	24	Hobson A-2	Rincon
Pan American Petroleum Co.	17	3	24	Hobson Fee 4	Rincon
Pan American Petroleum Co.	8	3	24	Hobson Fee 6	Rincon
Pan American Petroleum Co.	8	3	24	Hobson Fee 7	Rincon
Southern Pacific Land Co.	17	3	24	2	Rincon
Southern Pacific Land Co.	17	3	24	3	Rincon
Willis W. Bryant	21	4	21	2	Santa Paula
Henry DeMond	19	4	19	1	Sespe
Emma F. Exline	33	3	21	1	South Mountain
Associated Oil Co.	23	3	23	Dabney-Lloyd 2	Ventura
Associated Oil Co.	27	3	23	Lloyd 25	Ventura
Associated Oil Co.	27	3	23	Lloyd 54	Ventura
Associated Oil Co.	23	3	23	Lloyd 55	Ventura
Associated Oil Co.	23	3	23	McGonigle 3	Ventura
Associated Oil Co.	23	3	23	V. L. & W. 7	Ventura
Associated Oil Co.	23	3	23	V. L. & W. 8	Ventura
Shell Co.	28	3	23	Gosnell 26	Ventura
H. A. Walters	21	3	23	1	Ventura
Shell Co.	35	2	22	McGrath 1	-----
Standard Oil Co.	22	2	22	Eaton 1	-----
Standard Oil Co.	14	2	22	Ferro 1	-----
Standard Oil Co.	15	2	22	Saticoy-Citrus 3	-----

ADMINISTRATIVE DIVISION

WALTER W. BRADLEY, Deputy State Mineralogist.

Personnel.

Mr. Henry H. Symons of Berkeley has been appointed Statistician and Curator, and will have charge of the mineral exhibits of this division in addition to handling the statistics of the mineral production of California. These branches of the work have been handled by Mr. Walter W. Bradley since 1916, and in conjunction with his duties as deputy state mineralogist since 1923 because of the curtailment of the funds of the division. Pressure of administrative work compels and available funds now permit segregation of this work. Mr. Symons is a graduate of the School of Mines of the University of Montana, with mining experience in Montana and California.

New Publications.

During the quarterly period covered by this issue, the following publications of the Division of Mines and Mining have been made available for distribution:

Mining in California (quarterly), October, 1927, being Chapter 4 of State Mineralogist's Report XXIII. Price 25 cents. This chapter contains a report on the Mineral Resources of Mono County; also the Index for Report XXIII, covering the four quarterly chapters of 1927.

Summary of Operations, California Oil Fields, Vol. 13, Nos. 3, 4, 5, September, October and November, 1927, respectively. These contain articles on: 'Seal Beach Oil Field'; 'Loss of Production Due to Improper Completion Methods'; and 'Landing and Cementing Long Water Strings'.

Commercial Mineral Notes, Nos. 59, 60, February and March, 1928, respectively. These 'notes' contain the lists of 'mineral deposits wanted' and 'minerals for sale' issued in the form of a mimeographed sheet monthly. It is mailed free to those on the mailing list for 'Mining in California.'

Mails and Files.

The Division of Mines maintains, in addition to its correspondence files and the library, a mine file which includes original reports on the various mines and mineral properties of all kinds in California.

During each quarterly period there are several thousand letters received and answered at the San Francisco office alone, covering almost every phase of prospecting, mining, and developing mineral deposits, reduction problems, marketing of refined products, and mining law. In addition to this, hundreds of oral questions are answered daily, both at the main office and the district offices, for the many inquirers who come in for personal interviews and to consult the files and library.

DIVISION OF MINERALS AND STATISTICS

STATISTICS, MUSEUM, LABORATORY

HENRY H. SYMONS, Statistician and Curator.

STATISTICS

California continues to produce commercially, as for some years past, more than 50 different mineral substances, the total value of which for 1927 was estimated at \$377,205,000 (see January issue of *MINING IN CALIFORNIA*, page 61).

At the present writing (April 1st), reports are in hand from most of the producers. Data for several substances are now complete and have been compiled, being presented herewith.

Information at hand indicates that there was no production in California during 1927 of the following substances, which have at one time or another in the past been on the active list here: asbestos, arsenic, bismuth, fluorspar, mica, molybdenum, serpentine, sulphur, strontium, tin. There was production by a single operator in each of the following: Andalusite, antimony, bromine, calcium chloride, graphite, and lithia, the figures for which will have to be combined under the 'unapportioned' item in the final report. The first production of titanium minerals in commercial quantity in California was recorded last year. The production was made from the minerals ilmenite and rutile. Titanium is used in alloys of steel, in paint employed for protecting iron and steel and is also valuable in the dyeing industry.

BARYTES

Commercial shipments of crude barytes in California during 1927 amounted to a total of 17,993 tons valued at \$90,617 f.o.b. rail-shipping point, being a marked increase in both quantity and value over the 1926 figures of 4978 tons and \$38,165. The 1927 yield came from properties in Mariposa, Nevada and Orange counties. The barytes from Mariposa and Nevada counties was consumed principally in the manufacture of lithopone. That from Orange County was a furnace sinter, being a barytes gangue in a quicksilver ore, and was sold for use in oil-well drilling mud.

The plant of the Chemical and Pigments Company at Oakland, Alameda County, with a capacity of 25 tons of lithopone daily, continued operations during the year. This plant will thus afford an outlet for some of California's zinc ore as well as for barytes.

More than half of the total tonnage of barytes utilized in the United States is taken in the manufacture of lithopone, which is a chemically-prepared white pigment containing approximately 70% barium sulphate and 30% zinc sulphide. This is one of the principal constituents of 'flat' wall paints. Other important uses for barytes, after washing and grinding, are as an inert pigment and filler in paint, paper, linoleum, oilcloth and rubber manufacture and in the preparation of a number of chemicals, including barium binoxide, carbonate, chloride, nitrate, and the sulphate precipitated, or 'blanc fixe.'

BITUMINOUS ROCK

This material is essentially an un cemented sandstone which is saturated with and held together by a natural asphaltic constituent, probably the residue from the evaporation of a crude petroleum deposit. Bituminous rock is still used to a limited extent for road dressing in those districts adjacent to available deposits, though the manufacture of asphalt at the oil refineries has almost entirely superseded the direct use of the native material. The present operators of the Old City Street Improvement Company's quarry in Santa Cruz County advise that they are now putting on the market a material which can be laid cold. It will be especially applicable and valuable for patching jobs. Shipments from quarries in Santa Barbara and Santa Cruz counties in 1927 totaled 3515 tons of bituminous rock, valued at \$17,704 f.o.b. rail-shipping point.

CEMENT

Cement is the most important single structural material in the mineral output of California. During 1927 there was produced a total of 14,661,783 barrels valued at \$25,430,763 f.o.b. plant, being an increase of over half a million barrels in quantity, but only slightly in total value owing to a small drop in prices. The 1926 output was 13,797,173 barrels, valued at \$25,269,678, or an average of \$1.84 per barrel. The 1927 average was \$1.80 per barrel.

The 1927 production came from twelve operating plants in ten counties, and employed a total of 3803 men. The three plants in San Bernardino County made a total of 5,557,339 barrels, valued at \$9,823,839, the balance of the state's product coming from a single plant in each of the following counties: Calaveras, Contra Costa, Kern, Merced, Riverside, San Benito, San Mateo, Santa Cruz and Solano. The new plant of the Yosemite Portland Cement Company at Merced began operations and made commercial shipments in 1927.

CHROMITE

Chromic iron ore or chromite to the amount of 225 short tons, recalculated to the basis of 45% Cr₂O₃, valued at \$5,063 f.o.b. shipping point, was sold during the year 1927 in California.

The principal use of chromium is in alloys of steel and refractories, though it is also used in chemicals, the latest development of which is chromium plating. It is hoped that the development of the steel industry and the resumption of copper smelting on the Pacific Coast may create some demand for California's chromite, but the outlook for the immediate future is not encouraging.

PYRITE

A total production of 130,910 tons of pyrite valued at \$564,823 was reported shipped in California during 1927, from properties in Alameda, Mariposa, San Benito and Shasta counties. This was an increase both in quantity and value over the figures of 100,896 tons and \$466,088 in 1926.

The pyrite shipped had a sulphur content ranging up to 46.5% S. It is mostly used in the manufacture of sulphuric acid for explosives and fertilizers, though a portion is utilized directly in the preparation of agricultural fertilizer and insecticides.

This does not include the large quantities of pyrite, chalcopyrite and other sulphides which are otherwise treated for their valuable metal contents. Some sulphuric acid is annually made as a by-product in the course of roasting certain tonnages of Mother Lode auriferous concentrates while under treatment for their precious metal values.

MUSEUM

The Museum of the State Mining Bureau possesses an exceptionally fine collection of rocks and minerals of both economic and academic value. It ranks among the first five of such collections in North America; and contains not only specimens of most of the known minerals found in California, but much valuable and interesting material from other states and foreign countries as well.

Mineral specimens suitable for exhibit purposes are solicited, and their donation will be appreciated by the State Mining Bureau as well as by those who utilize the facilities of the collection.

The exhibit is daily visited by engineers, students, business men and prospectors as well as tourists and mere sightseers. Besides its practical use in the economic development of California's mineral resources, the collection is a most valuable educational asset to the state and to San Francisco.

LABORATORY

FRANK SANBORN, Mineral Technologist.

Minerals containing the rare-earth metals are occasionally received at this laboratory for identification. Such minerals have come from Tulare and Riverside counties, but so far no commercial production has been reported from these sections of the state. A mineral was received a day or so ago from Riverside County that may be cerite, but as yet has not been identified exactly.

The rare earths are usually found associated with one another, cerium being the most abundant of these elements. The chief use of cerium is in the preparation of an iron alloy called ferrocerium. This alloy is hard and brittle, and will, upon being struck or filed, give off a shower of sparks, which fact makes the composition valuable in the manufacture of ignition devices. There are other minor uses for cerium, such as in the making of chemicals and incandescent mantles. There is no settled market for cerium.

Over 1300 samples were received and determined at this laboratory during the three-month period covered by this report.

LIBRARY

E. A. LOWE, Librarian.

In addition to the numerous standard works, authoritative information on many phases of the mining and mineral industry is constantly being issued in the form of reports and bulletins by various government agencies.

The library of the Division of Mines and Mining contains some five thousand selected volumes on mines, mining and allied subjects, and it is also a repository for reports and bulletins of the technical departments of federal and state governments and of educational institutions, both domestic and foreign.

It is not the dearth of the latter publications, but rather a lack of knowledge of just what has been published and where the reports may be consulted or obtained, that embarrasses the ordinary person seeking specific information.

To assist in making the public acquainted with this valuable source of current technical information, *MINING IN CALIFORNIA* contains under this heading a list of all books and official reports and bulletins received, with names of publishers or issuing departments.

Files of all the leading technical journals will be found in the library, and county and state maps, topographical sheets and geological folios. Current copies of local newspapers published in the mining centers of the state are available for reference.

The library and reading room are open to the public during the usual office hours, when the librarian may be freely called upon for all necessary assistance.

OFFICIAL PUBLICATIONS RECEIVED

Governmental.

U. S. Geological Survey:

Professional Paper 152—Geography, Geology and Mineral Resources of Part of Southeastern Idaho. By Geo. Rogers Mansfield.

Professional Paper 150-C—A Section of the Kaibab Limestone in Kaibab Gulch, Utah. By L. F. Noble.

Bulletin 795-F—The Gilbert District Nevada. By Henry G. Ferguson.

Bulletin 795-G—Phosphate Rock in the Three Forks-Yellowstone Park Region, Montana. By D. Dale Condit, E. H. Finch and J. T. Pardee.

Bulletin 795-H—A Manganese Deposit of Pleistocene Age in Bannock County, Idaho. By D. F. Hewett.

Bulletin 796-B—Geology and Oil and Gas Prospects of Northeastern Colorado. By Kirtley F. Mather, James Gilluly and Ralph G. Lusk.

Bulletin 796-C—Geology and Coal Resources of the Salina Canyon District, Sevier County, Utah. By Edmund M. Spieker and Arthur A. Baker.

Bulletin 796-D—Geology and Oil and Gas Possibilities of the Bell Springs District, Carbon County, Wyoming. By C. E. Dobbin, H. W. Hoots and C. H. Dane.

Bulletin 797-A—Mineral Industry of Alaska in 1926 and Administrative Report. By Philip S. Smith.

Bulletin 788-E—Topographic Instructions of the U. S. Geological Survey.

Water Supply Paper 596-G—Chemical Character of Florida. By W. D. Collins and C. S. Howard.

Water Supply Paper 596-H—Notes on Practical Water Analysis. By W. D. Collins.

Water Supply Paper 596-F—Laboratory Tests on Physical Properties of Water-Bearing Materials. By Norah Dowell Stearns.

Annual Report of the Director to the Secretary of the Interior for the Fiscal Year Ended June 30, 1927.

U. S. Bureau of Mines:

Technical Paper 403—Hydraulic Classification, Its Theory, Mechanical Development and Application to Ore Dressing. By A. W. Fahrenwald.

Technical Paper 417—Analyses of Indiana Coals. By W. N. Logan.

Technical Paper 420—Geophysical Methods of Prospecting. By A. E. Eve and D. A. Keys.

Technical Paper 437—Coke-Oven Accidents in the United States. By William W. Adams.

Bulletin 222—The Metallurgy of Quicksilver. By L. H. Duschak and C. N. Schuette.

Bulletin 229—Fifty-nine Coal-Mine Fires. By G. S. Rice, J. W. Paul and M. M. von Bernewitz.

Bulletin 245—Mining of Thin Coal Beds in the Anthracite Region of Pennsylvania. By Dever C. Ashmead.

Bulletin 274—Potash Mining in Germany and France. By Geo. S. Rice and John A. Davis.

Bulletin 277—Safety in Coal Mining (A Handbook). By Geo. S. Rice.

Bulletin 283—Coal-Mine Fatalities of the United States, 1926.

Bulletin 287—Gases from Blasting in Tunnels and Metal-Mine Drifts. By E. D. Gardner.

Bulletin 289—Petroleum Refinery Statistics, 1926. By G. R. Hopkins.

Mineral Resources of the United States:

Abrasives Materials in 1926.

Asbestos in 1926.

Coal in 1925.

Coke and By-Products in 1925.

Gold, Silver, Copper, Lead and Zinc in California and Oregon in 1926.

Lead and Zinc Pigments and Salts in 1926.

Lead in 1926.

Magnesium and Its Compounds in 1926.

Manganese and Manganiferous Ores in 1926.

Mica in 1926.

Phosphate Rock in 1926.

Potash in 1926.

Rare Metals in 1926.

Sand and Gravel in 1926.

Secondary Metals in 1926.

Silver, Copper, Lead and Zinc in the Central States in 1926.

Stone in 1926.

Talc and Soapstone in 1926.

Zinc in 1926.

Reports of Investigations:

Serial No.

2843—The Sulphur Content of Commercial Motor Fuels. By A. J. Kraemer, E. C. Lane, and C. S. Luce.

(Results of tests of samples collected by the Bureau of Mines in July, 1927; with the conclusion that the sulphur content of most commercial gasoline is less than 0.10 per cent.)

2844—Coal-Mine Fatalities in November, 1927. By W. W. Adams.

(Discusses fatality rates and gives detailed statistical tabulations of the number and causes of coal-mine accidents.)

2845—Consumption of Explosives in November, 1927. By W. W. Adams. (Statistical analysis of production and sales.)

2846—Properties of Calif. Crude Oils III; Additional Analyses. By A. J. Kraemer.

(The third of a series of papers on the characteristics of representative California petroleums.)

2847—Prevention of Hydrogen Sulphide Poisoning in Handling and Refining High-Sulphur Petroleums. By H. C. Fowler.

(Discusses the occurrence, physiological effects and dangers of hydrogen sulphide which is frequently a serious health and safety problem in the petroleum industry. Describes a method of detecting the gas and outlines safety measures.)

- 2848—Accident-Severity Rates for Certain Mines and Quarries. By W. W. Adams.

(Analysis and tabulation of data submitted in the National Safety Competition for the "Sentinels of Safety" trophy.)

- 2849—Analyses of Crude Oils from the West Texas District. By A. J. Kraemer, Peter Grandone, and C. S. Luce.

(Brief production histories of the several fields in the district and detailed analyses of oil samples from them.)

- 2850—Stocks of Petroleum Products held by Exporters. By G. R. Hopkins.

(Statistical analysis of such stocks during the year 1927 and of exports during 1925–26, with an alphabetical list of exporting companies.)

- 2851—The Wire Saw in Slate Quarrying. Supplementary Report. By J. R. Thoemen.

(Results of further successful tests in Pennsylvania slate quarries with this novel device recently introduced from Europe.)

- 2852—Consumption of Reagents Used in Flotation, 1926. By Thomas Varley.

(Statistical summary, with explanatory comment, covering use of a wide variety of chemicals and oils in the flotation process in the metallurgical plants of the United States.)

- 2853—The Resistance of Coal Mine Entries to the Flow of Air. By H. P. Greenwald and G. E. McElroy.

(Deals with fourth phase of an extensive research on coal-mine ventilation factors, referring especially to the resistance caused by right-angle bends.)

- 2854—Additions, Removals and Changes in Permissible List of Explosives from July 1, 1927, to January 31, 1928. By G. St. J. Perrott and J. E. Tiffany.

(Supplements complete list of explosives tested and approved by Bureau of Mines, which was published in Serial 2818, dated June 30, 1927.)

- 2855—Chambering Cut-Holes of Drift Rounds in a Western Metal Mine. By E. D. Gardner.

(Describes methods of chambering cut-holes in firing standard drift rounds at an Arizona mine, and points out that the practice could probably be used to advantage in blasting operations in other metal mines where ground is difficult to break.)

- 2856—Status of Rock-Dusting in the United States. By D. Harrington, J. J. Forbes, and F. Feehan.

(Reviews progress made in the movement for rock-dusting of all bituminous coal mines as a preventive of mine explosions. Shows that, while the movement has progressed considerably, many mining communities are slow to take advantage of this effective safeguard.)

- 2857—A Comparison of Ground Temperatures at Different Depths and Temperature Fluctuations of the Atmosphere. By E. L. Rawlins and T. W. Johnson.

(Gives results of tests conducted at Bartlesville, Oklahoma, to obtain information as to proper depth for burying natural gas pipe lines to minimize temperature fluctuations and thus prevent excessive leakage of gas due to explosion and contraction in the pipe joints.)

- 2858—Tests of Atmospheres in Chesapeake and Ohio Railroad Tunnels Between Clifton Forge, Virginia, and Hinton, West Virginia. By R. R. Sayers, L. B. Berger, and W. P. Yant.

(Detailed report of several tests made to determine temperature, humidity, and composition of tunnel atmospheres and their physiological effects on enginemen.)

Information Circulars:

Serial No.

- 6056—Prevention of Accidents with Explosives in the Tri-State Zinc and Lead Ore Producing District. By S. P. Howell.

(Results of Observations concerning blasting practice in Missouri-Kansas-Oklahoma zinc and lead district, with special reference to the prevention of misfires and of accidents while charging and from premature explosions.)

- 6057—The Determination of Carbon Monoxide in Mines with the "Iodine Pentoxide" Detector. By G. S. McCaa and John A. Davis.
(A concise description, intended especially for mine-rescue workers, of a device and method which determines the amount of carbon monoxide in mine air quickly, simply, and with reasonable accuracy.)
- 6058—List of Permissible Mining Equipment.
(Includes all mining equipment tested and approved by the Bureau of Mines, with special reference to safety, to January 1, 1928.)
- 6059—Accident Prevention Measures at the Moctezuma Copper Company. By E. D. Gardner.
(Outlines safety measures employed by a mining company at Pilares, Mexico, which is making a noteworthy record in the prevention of accidents.)
- 6060—Work of the Experiment Stations of the Bureau of Mines. By A. C. Fieldner and Alden H. Emery.
(Gives an outline of the various technologic investigations being conducted at the experiment stations and offices of the Bureau of Mines located in the different mining fields.)
- 6061—Sources and Distribution of Major Petroleum Products, Central United States—1926. By E. B. Swanson and A. H. Redfield.
(A statistical summary, completing a series of regional studies pertaining to the distribution of petroleum products, inaugurated for the purpose of presenting central fundamental statistics pertaining to the industry.)
- U. S. Army: Annual Report of the Chief of Engineers, Part 1 and Part 2.
- U. S. Coast and Geodetic Survey: Seismological Report, April, Map, June, 1926. Serial No. 406. By Frank Neumann.
- California State Library: News Notes of California Libraries.
- Colorado Geological Survey:
- Bulletin 3—Geology and Ore Deposits of the Alma District. By Horace B. Patton, Arthur J. Hoskin and G. Montague Butler.
 - Bulletin 4—Geology and Ore Deposits of the Monarch and Tomichi Districts, Colorado. By R. D. Crawford; and
 - Bulletin 5—Part I, Reconnaissance of the Geology of the Rabbit Ears Region. By F. F. Grout, P. G. Worcester and Junius Henderson.
- II, Permian or "Permo-Carboniferous" of the Eastern Foot-hills of the Rocky Mountains in Colorado. By R. M. Butters.
- Bulletin 7—Bibliography of Colorado Geology and Mining with Subject Index from the Earliest Explorations to 1912. By Olive M. Jones.
- Bulletin 13—Geology and Ore Deposits of the Platoro-Summitville Mining District, Colorado. By Horace B. Patton.
- Bulletin 16—Radium, Uranium and Vanadium Deposits of Southwestern Colorado. By R. C. Coffin.
- Bulletin 17—Twin Lakes District of Colorado. By J. V. Howell.
- Bulletin 18—Fluorspar Deposits of Colorado. By Harry A. Aurand.
- Bulletin 21—The Geology of the Ward Region, Boulder County, Colorado. By P. G. Worcester.
- Bulletin 22—Mineral Deposits of the Western Slope. By H. A. Aurand.
- Bulletin 24—Some Anticlines of Western Colorado.
- Bulletin 26—Preliminary Report on the Underground Waters of a Part of Southeastern Colorado. By R. C. Coffin and A. J. Tieje.
- Bulletin 27—Part I, Underground Water Possibilities of La Junta Area, Colorado.
- II, Water Resources of Parts of Crowley and Otero Counties.
- III, Geology of Parts of Las Animas, Otero, and Bent Counties.
- Bulletin 28—Oil and Water Possibilities of Parts of Delta and Mesa Counties, Colorado. By Herbert H. Weeks.
- Bulletin 30—Geology and Ore Deposits of the Red Cliff District, Colorado. By R. D. Crawford and Russell Gibson.

- Bulletin 31—Geology of the Tarryall District, Park County, Colorado. By Garrett A. Muilenburg.
- Connecticut State Geological and Natural History Survey:
 - Bulletin 40—The Geology of the Shepaug Aqueduct Tunnel, Litchfield County, Connecticut. By William Macdonough Agar, with a chapter by Robert A. Cairns.
 - Bulletin 41—Guide to the Geology of Middletown, Connecticut, and Vicinity. By William North Rice and Wilbur Garland Foye.
- Florida Geological Survey: Eighteenth Annual Report of.
- Illinois State Geological Survey:
 - Bulletin 31—Coal Stripping Possibilities in Southern and Southwestern Illinois. By G. H. Cady.
 - Press Bulletin 13—Illinois Petroleum. By A. H. Bell and L. E. Workman.
 - Press Bulletin 14—Illinois Petroleum. By Gail F. Moulton and Jackson Young.
 - Report of Investigation 13—Stratigraphy and Geologic Structure of Northern Illinois, with Special Reference to Underground Water Supplies. By F. T. Thwaites.
 - Report of Investigation 15—Preliminary Report on the Fuller's Earth Deposits of Pulaski County. By J. E. Lamar.
- Kansas State Geological Survey: Bulletin 13—Underground Resources of Kansas. By Raymond C. Moore and Kenneth K. Landes.
- Kansas State Inspector of Oils: Annual Report of, December, 1926, to November 30, 1927.
- Kentucky Geological Survey:
 - Nest of Sinking Streams. By Dr. Willard R. Jillson.
 - Topography of Kentucky. By Willard Rouse Jillson.
- North Carolina Department of Conservation and Development: Bulletin 34—Discharge Records of North Carolina Streams, 1889—1923.
- Ohio Geological Survey:
 - Bulletin 31—Geology of Vinton County. By Wilbur Stout.
 - Bulletin 32—Fauna of the Silica Shale of Lucas County. By Grace Anne Stewart.
- Oklahoma Geological Survey:
 - Bulletin 42—Mineral Resources in Oklahoma. By John S. Redfield.
 - Bulletin 43—Oil Sands and Production Relations. By H. C. George and W. F. Cloud.
- Pennsylvania Department of Internal Affairs: Bulletin 92—Topographic and Geologic Survey—Anthracite Culm and Silt. By James D. Sisler.
- Tennessee Division of Geology: Bulletin 34—Water Resources of Tennessee. By Warren R. King.
- Virginia Geological Survey: Bulletin 30—Geology of the Gold-Pyrite Belt of the Northeastern Piedmont, Virginia. By John T. Lonsdale.
- Australasian Institute of Mining and Metallurgy: Proceedings of the, No. 64 and No. 66.
- Australian Museum: Records of the, Vol. XVI, No. 3.
- Barcelona, Real Academia de Ciencias y Artes de, Memorias de la, Vol XX;
 - Num. 7—Los Movimientos Ritmicos en las Celulas.
 - Num. 8—Itinerario Geologico A Traves del Bajo Aragon y el Maestrazgo.
 - Num. 9—De Algunas Causas de Instabilidad en las Iglesias Goticas.
 - Num. 10—Accion de la Luz en Los Repoblados de Robles.
 - Num. 11—Algunos Prejuicios Geograficos.
 - Num. 12—Acustica de las Salas de Adupcion.
- Bulgarian Geological Survey: Review of, Jahrg 1 Heft 1, 1927.
- Canada Department of Mines: Report of the, for the Fiscal Year Ending March 31, 1927.
- Canadian Mining and Metallurgical Bulletin No. 189, No. 190, No. 191.
- Finland Geologiska Kommissionen: Bulletin 79—Studien Uber den Gesteinsaufbau der Kittil-Lappmark. von Victor Hackman.
- Great Britain Society of Chemical Industry: Hydrocarbon Synthesis from Carbon Monoxide and Hydrogen. By Oliver C. Elvins.
- Institution of Petroleum Technologists: Possible Auxiliary Sources of Liquid Fuels. By Prof. Alfred W. Nash.
- Mexico Secretaria de Industria, Comercio y Trabajo: Reglamento de Trabajos Petroleros. Boletin Minero, Tomo XXV, Numero 2.

- Montevideo: *Anales del Museo de Historia Natural de, Serie II, Tomo II.*
 New Zealand Department of Scientific and Industrial Research: Sixtieth Annual Report of the Dominion Laboratory. By J. S. Maclaurin.
- Ontario Department of Mines:
 Thirtieth Annual Report of the, Vol. XXXVI, Part III, 1827.
 Bulletin 64—Preliminary Report on the Mineral Production of Ontario in 1927.
 Philippine Journal of Science: Vol. 34, No. 3; No. 4.
 Republica de Colomboa Biblioteca del Museo Nacional: *Notas Geograficas y Geologicas.* Por Ricardo Lleras Codazzi.
 Los Minerales de Colomboa. Por Ricardo Lleras Codazzi.
 Rio de Janeiro Museu Nacional: Boletin, Vol. III, No. 3; No. 2.
- South Australia Department of Mines:
 Mining Review for the Half-Year Ended June 30, 1927, No. 46.
 Annual Report of the Director of Mines and Government Geologist for 1926.
- Transvaal Chamber of Mines: *The Gold of the Rand.*
- U. S. S. R., Mineral Resources of the:
 Aluminum and Bauxite. By S. Maliaykin.
 Part 11—Bismuth. By C. P. Denguin.
 Part 12—Tungsten. By G. Denguin.
 Part 20—Cadmium. By N. Boerling and V. Lyjin.
 Part 24—Manganese. By A. J. Serek.
 Part 27—Arsenic. By S. Konstantov.
 Part 37—Quicksilver. By N. Boerling, S. Konstantov and M. Likhareva.
 Bulletins du Comite Geologique:
 Vol. XLI, No. 6-9; XLI, No. 10; XLV, No. 3; XLV, No. 4; XLV, No. 5;
 XLV, No. 6; XLV, No. 7; XLV, No. 8; XLV, No. 9; XLV, No. 10;
 XLVI, No. 1; XLVI, No. 2; XLVI, No. 3; XLVI, No. 4; XLVI, No. 5;
 XLVI, No. 6; XLVI, No. 7; XLVI, No. 8-9; XLV, No. 2; XLIV, No. 10;
 XLIV, No. 9; XLIV, No. 8.
- Annual Report of the Mineral Resources of the U. S. S. R. during the Fiscal Year 1925-26.
- Livarison 74—Lower Carboniferous Cephalopoda from the Son-Kul Region (Tien-Shan Mountains).
- Livarison 56—Description Geologique des Environs des Sources Minerals de Matsesta et d'Angora.
- Societies and Educational Institutions.**
- Birmingham, University of, Department of Oil Engineering and Refining: A Note on Gas Analysis. By H. M. Stanley and A. W. Nash.
- California, University of:
 Northwestern Continuation of the San Onofre Breccia. By A. O. Woodford and T. L. Bailey.
 The Occurrence of Phylogenetic Status of Merycodus from the Mohave Desert Tertiary. By E. L. Furlong.
 The Geology and Paleontology of the Type Section of the Meganos Formation (Lower Middle Eocene) of California. By Bruce L. Clark and A. O. Woodford. A New Species of Eocene Coral, *Archohelia Clarki*, from California. By Thomas Wayland Vaughan.
- Colorado School of Mines Magazine, Vol. 17, No. 10.
- Columbia University: Bulletin of Information, 28th Series, No. 20.
- Harvard University:
 McGovernite, a New Mineral from Sterling Hill, New Jersey. By C. Palache and L. H. Bauer.
 Dehydration and Optical Studies of Alunogen, Nontronite and Griffithite. By Esper S. Larsen and George Steiger.
 The Hiddenite Occurrence in North Carolina. By S. C. Davidson.
- Minnesota, University of:
 Bulletin 237—Rations for Fattening Baby Beeves and the Selection of Calves for Baby Beef Production.
 Bulletin 238—Forest Planting Experiments in Minnesota.
 Bulletin 239—Soybeans and Soybean Hay in the Dairy Ration.
- Missouri, University of:
 Properties of Refractories in Zinc Metallurgy. By E. S. Wheeler, A. H. Kuechler and H. M. Lawrence.

- Oregon, University of: Vol. 1, No. 2—A Quantitative Mineralogical and Chemical Classification of Igneous Rocks. By Edwin T. Hodge.
- Strasbourg, Universite de: Memoires du Service de la Carte Geologique d'Alsace et de Lorraine.
- Tohoku Imperial University, Sendai, Japan: The Science Report of the, Second Series (Geology). Vol. X, No. 4.
- Waseda University, Tokyo, Japan: Memoirs of the Faculty of Science and Engineering, No. 5.
- American Institute of Mining and Metallurgical Engineers: Transactions of, Vol. LXXV.
- American Philosophical Society: Proceedings of the, Vol. LXVI, 1927.
- Economic Geology, Vol. XXIII, No. 1; No. 2.
- Engineers' Society of Western Pennsylvania: Proceedings of the, Vol. 43, No. 8.
- Institution of Mining and Metallurgy: Bulletin 279—December, 1927; No. 280, Jan. 1928.
- Mineralogical Society of America: Journal of the American Mineralogist, Vol. 13, No. 3; No. 4.
- Philadelphia, The Academy of Natural Sciences of: Proceedings of, Vol. LXXIX.
- Smithsonian Institution:
- Newly Discovered Meteoric Irons from the Wallapai (Hualapai) Indian Reservation, Arizona.
 - Rossite and Metarossite, Two New Vanadates from Colorado.
 - Western Society of Engineers: Journal, Vol. XXXII, No. 10; No. 11.

Maps.

Topographic Maps:

Arlington Heights, Ill.	Iaeger, W. Va.—Va.
Arnoldsburg, W. Va.	La Habra, Calif.
Belington, W. Va.	Mineral Wells, Tex.
Blum, Texas.	New Braunfels, Tex.
Burnsville, W. Va.	Pagosa Springs, Colo.
Galesburg, Ill.	Pearsall, Tex.
Glendora, Calif.	Pierce Pond, Me.
Graham, Tex.	Rocky Mount, Va.
Grosvenor, Tex.	Shell Knob, Mo.
Hillsboro, Wis.	Smithson Valley, Tex.
Hinsdale, Ill.	Streator, Ill.
Holderness, N. H.	

Books.

- Handbook of Ore Dressing, Taggart.
Chemical Engineering Catalog, 1926.

Current Magazines on File.

For the convenience of persons wishing to consult the technical magazines in the reading room, a list of those on file is appended:

- American Petroleum Institute, New York.
Architect and Engineer, San Francisco.
Arizona Mining Journal, Phoenix, Arizona.
Asbestos, Philadelphia, Pennsylvania.
Brick and Clay Record, Chicago.
Bulletin, Union Oil Co., Los Angeles.
California Journal of Development, San Francisco.
Cement, Mill and Quarry, Chicago, Illinois.
Chemical-Engineering and Mining Review, Melbourne, Australia.
Engineering and Mining Journal, New York.
Explosives Engineer, Wilmington, Del.
Financial Insurance News, Los Angeles, California.
Graphite, Jersey City.
Journal of Electricity and Western Industry, San Francisco.
Metallurgical and Chemical Engineering, New York.
Mine and Quarry, Chicago.

Mining and Engineering Record, Vancouver, B. C.
Mining and Oil Bulletin, Los Angeles.
Oil Age, Los Angeles.
Oil and Gas Journal, Tulsa, Oklahoma.
Oil and Gas News, Kansas City.
Oil News, Galesburg, Illinois.
Oildom, New York.
Oil, Paint and Drug Reporter, New York.
Oil Trade Journal, New York.
Oil Weekly, Houston, Texas.
Petroleum Age, New York.
Petroleum Record, Los Angeles.
Petroleum World, Los Angeles.
Queensland Government Mining Journal, Brisbane, Australia.
Rock Products, Chicago, Illinois.
Safety News, Industrial Accident Commission, San Francisco.
Salt Lake Mining Review, Salt Lake City, Utah.
Southwest Builder and Contractor, Los Angeles.
Standard Oil Bulletin, San Francisco.
Stone, New York.
The Record, Associated Oil Company, San Francisco.
Through the Ages, Baltimore.

Newspapers.

The following papers are received and kept on file in the library:

Amador Dispatch, Jackson, Cal.
Arkansas Oil and Mineral News, Hot Springs National Park (Arkansas).
Barstow Printer, Barstow, Cal.
Blythe Herald, Blythe, Cal.
Bridgeport Chronicle-Union, Bridgeport, Mono Co., Cal.
Calaveras Prospect, San Andreas, Cal.
California Oil World, Los Angeles, Cal.
Cloverdale Reveille, Cloverdale, Cal.
Colusa Daily Sun, Colusa, Cal.
Daily Commercial News, San Francisco, Cal.
Daily Midway Driller, Taft, Cal.
Del Norte Triplicate, Crescent City, Cal.
Exeter Sun, Exeter, Cal.
Gateway Gazette, Beaumont, Cal.
Goldfield News, Goldfield, Nevada.
Guerneville Times, Guerneville, Cal.
Healdsburg Enterprise, Healdsburg, Cal.
Humboldt Standard, Eureka, Cal.
Inyo Independent, Independence, Cal.
Inyo Register, Bishop, Cal.
Ione Valley Echo, Ione, Cal.
Lake County Bee, Lakeport, Cal.
Mining and Financial Record, Denver, Colo.
Mountain Democrat, Placerville, Cal.
Mountain Messenger, Downieville, Cal.
Nevada Mining Press, Reno, Nevada.
Oatman Mining News, Oatman, Arizona.
Oregon Observer, Grants Pass, Oregon.
Oroville Daily Register, Oroville, Cal.
Petroleum Reporter, Taft, Cal.
Placer Herald, Auburn, Cal.
Plumas Independent, Quincy, Cal.
Plumas National Bulletin, Quincy, Cal.
Randsburg Times, Randsburg, Cal.
San Diego News, San Diego, Cal.
Shasta Courier, Redding, Cal.
Siskiyou News, Yreka, Cal.
Stockton Record, Stockton, Cal.
Tuolumne Prospector, Tuolumne, Cal.
Ventura Daily Post, Ventura, Cal.
Weekly Trinity Journal, Weaverville, Cal.
Western Sentinel, Etna Mills, Cal.

PRODUCERS AND CONSUMERS

The producer and consumer of mineral products are mutually dependent upon each other for their prosperity, and one of the most direct aids rendered by the Bureau to the mining industry in the past has been that of bringing producers and consumers into direct touch with each other.

This work has been carried on largely by correspondence, supplemented by personal consultation. Lists of buyers of all the commercial minerals produced in California have been made available to producers upon request, and likewise the owners of undeveloped deposits of various minerals, and producers of them, have been made known to those looking for raw mineral products.

When the publication of *MINING IN CALIFORNIA* was on a monthly basis, current inquiries from buyers and sellers were summarized and lists of mineral products or deposits 'wanted' or 'for sale' included in each issue.

It is important that inquiries of this nature reach the mining public as soon as possible and in order to avoid the delay incident to the present quarterly publication of *MINING IN CALIFORNIA*, these lists are now issued monthly in the form of a mimeographed sheet under the title of 'Commercial Mineral Notes,' and sent to those on the mailing list for *MINING IN CALIFORNIA*.

EMPLOYMENT SERVICE

Following the establishment of the Mining Division branch offices in 1919, a free technical employment service was offered as a mutual aid to mine operators and technical men for the general benefit of the mineral industry.

Briefly summarized, men desiring positions are registered, the cards containing an outline of the applicant's qualifications, position wanted, salary desired, etc., and as notices of 'positions open' are received, the names and addresses of all applicants deemed qualified are sent to the prospective employer for direct negotiations.

Telephone and telegraphic communications are also given immediate attention.

Technical men, or those qualified for supervisory positions, and vacancies of like nature, only are registered, as no attempt will be made to supply common mine and mill labor.

A list of current applications for positions and 'positions open' is carried in each issue. Notices are designated by a key number, and the name and address corresponding to any number will be supplied upon request, without delay or charge of any kind. If desired, recommendations may be filed with an application, but copies only should be sent to the Division of Mines and Mining, to avoid possible loss. Registration cards for the use of both prospective employers and employees may be obtained upon request, and a cordial invitation is extended to the industry to make free use of the facilities afforded.

POSITIONS WANTED

- 61-4 Mining or geological work. Technical graduate (1916). Twelve years' general mining experience in western states. Speaks fair Spanish. Will go anywhere. Age 37. Married. Salary wanted, \$175, minimum. References.
- 61-5 Mine superintendent or assayer. Three years' experience as foreman, one as superintendent and 2 as assayer; Colorado, Texas and Mexico. Age 33. Married. References.
- 61-6 Milling. Eight years' varied experience as millman and mill foreman. Age 45. Single. Salary wanted, \$250. References.

PUBLICATIONS OF THE DIVISION OF MINES AND MINING

During the past forty-eight years, in carrying out the provisions of the organic act creating the former California State Mining Bureau, there have been published many reports, bulletins and maps which go to make up a library of detailed information on the mineral industry of the state, a large part of which could not be duplicated from any other source.

One feature that has added to the popularity of the publications is that many of them have been distributed without cost to the public, and even the more elaborate ones have been sold at a price which barely covers the cost of printing.

Owing to the fact that funds for the advancing of the work of this department have often been limited, many of the reports and bulletins mentioned were printed in limited editions which are now entirely exhausted.

Copies of such publications are available, however, in the office of the Division of Mines and Mining, in the Ferry Building, San Francisco; New Orpheum Building, Los Angeles; Capitol Extension Building, Sacramento; Santa Maria; Santa Paula; Coalinga; Taft; Bakersfield. They may also be found in many public, private and technical libraries in California and other states, and foreign countries.

A catalog of all publications from 1880 to 1917, giving a synopsis of their contents, is issued as Bulletin No. 77.

Publications in stock may be obtained by addressing any of the above offices and enclosing the requisite amount in the case of publications that have a list price. Only coin, stamps or money orders should be sent, and it will be appreciated if remittance is made in this manner rather than by personal check.

The prices noted include delivery charges to all parts of the United States. Money orders should be made payable to the Division of Mines and Mining.

REPORTS

Asterisks (**) indicate the publication is out of print.

	Price
**First Annual Report of the State Mineralogist, 1880, 43 pp. Henry G. Hanks-----	-----
**Second Annual Report of the State Mineralogist, 1882, 514 pp., 4 illustrations, 1 map. Henry G. Hanks-----	-----
**Third Annual Report of the State Mineralogist, 1883, 111 pp., 21 illustrations. Henry G. Hanks-----	-----
**Fourth Annual Report of the State Mineralogist, 1884, 410 pp., 7 illustrations. Henry G. Hanks-----	-----
**Fifth Annual Report of the State Mineralogist, 1885, 234 pp., 15 illustrations, 1 geological map. Henry G. Hanks-----	-----
**Sixth Annual Report of the State Mineralogist, Part I, 1886, 145 pp., 3 illustrations, 1 map. Henry G. Hanks-----	-----
**Part II, 1887, 222 pp., 36 illustrations. William Irelan, Jr.-----	-----
**Seventh Annual Report of the State Mineralogist, 1887, 315 pp. William Irelan, Jr.-----	-----
**Eighth Annual Report of the State Mineralogist, 1888, 948 pp., 122 illustrations. William Irelan, Jr.-----	-----
**Ninth Annual Report of the State Mineralogist, 1889, 352 pp., 57 illustrations, 2 maps. William Irelan, Jr.-----	-----
**Tenth Annual Report of the State Mineralogist, 1890, 983 pp., 179 illustrations, 10 maps. William Irelan, Jr.-----	-----

REPORTS—Continued

Asterisks (**) indicate the publication is out of print.

	Price
Eleventh Report (First Biennial) of the State Mineralogist, for the two years ending September 15, 1892, 612 pp., 73 illustrations, 4 maps. William Irelan, Jr.	\$1.00
**Twelfth Report (Second Biennial) of the State Mineralogist, for the two years ending September 15, 1894, 541 pp., 101 illustrations, 5 maps. J. J. Crawford	-----
**Thirteenth Report (Third Biennial) of the State Mineralogist, for the two years ending September 15, 1896, 726 pp., 93 illustrations, 1 map. J. J. Crawford	-----
Chapters of the State Mineralogist's Report, Biennial Period, 1913-1914, Fletcher Hamilton:	-----
**Mines and Mineral Resources, Amador, Calaveras and Tuolumne Counties, 172 pp., paper	-----
Mines and Mineral Resources, Colusa, Glenn, Lake, Marin, Napa, Solano, Sonoma and Yolo Counties, 208 pp., paper	.50
Mines and Mineral Resources, Del Norte, Humboldt, and Mendocino Counties, 59 pp., paper	.25
**Mines and Mineral Resources, Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin and Stanislaus Counties, 220 pages, paper	-----
Mines and Mineral Resources of Imperial and San Diego Counties, 113 pp., paper	.35
**Mines and Mineral Resources, Shasta, Siskiyou and Trinity Counties, 180 pp., paper	-----
**Fourteenth Report of the State Mineralogist, for the Biennial Period 1913-1914, Fletcher Hamilton, 1915:	-----
A General Report on the Mines and Mineral Resources of Amador, Calaveras, Tuolumne, Colusa, Glenn, Lake, Marin, Napa, Solano, Sonoma, Yolo, Del Norte, Humboldt, Mendocino, Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin, Stanislaus, San Diego, Imperial, Shasta, Siskiyou, and Trinity Counties, 974 pp., 275 illustrations, cloth	-----
Chapters of the State Mineralogist's Report, Biennial Period, 1915-1916, Fletcher Hamilton:	-----
**Mines and Mineral Resources, Alpine, Inyo and Mono Counties, 176 pp., paper	-----
**Mines and Mineral Resources, Butte, Lassen, Modoc, Sutter, and Tehama Counties, 91 pp., paper	-----
Mines and Mineral Resources, El Dorado, Placer, Sacramento, and Yuba Counties, 198 pp., paper	.65
Mines and Mineral Resources, Monterey, San Benito, San Luis Obispo, Santa Barbara, and Ventura Counties, 183 pp., paper	.65
Mines and Mineral Resources, Los Angeles, Orange, and Riverside Counties, 136 pp., paper	.50
**Mines and Mineral Resources, San Bernardino and Tulare Counties, 186 pp., paper	-----
**Fifteenth Report of the State Mineralogist, for the Biennial Period 1915-1916, Fletcher Hamilton, 1917:	-----
A General Report on the Mines and Mineral Resources of Alpine, Inyo, Mono, Butte, Lassen, Modoc, Sutter, Tehama, Placer, Sacramento, Yuba, Los Angeles, Orange, Riverside, San Benito, San Luis Obispo, Santa Barbara, Ventura, San Bernardino and Tulare Counties, 990 pp., 413 illustrations, cloth	-----
Chapters of the State Mineralogist's Report, Biennial Period 1917-1918, Fletcher Hamilton:	-----
Mines and Mineral Resources of Nevada County, 270 pp., paper	.75
Mines and Mineral Resources of Plumas County, 188 pp., paper	.50
Mines and Mineral Resources of Sierra County, 144 pp., paper	.50
Seventeenth Report of the State Mineralogist, 1920, Mining in California during 1920, Fletcher Hamilton: 562 pp., 71 illustrations, cloth	-----
Eighteenth Report of the State Mineralogist, 1922, Mining in California, Fletcher Hamilton. Chapters published monthly beginning with January, 1922:	1.75

REPORTS—Continued

Asterisks (**) indicate the publication is out of print.

	Price
**January, **February, March, April, May, June, July, August, September, October, November, December, 1922-----	Free
Chapters of Nineteenth Report of the State Mineralogist, 'Mining in California,' Fletcher Hamilton and Lloyd L. Root. January, February, March, September, 1923 -----	Free
Chapters of Twentieth Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly. January, April, **July, October, 1924, per copy-----	\$0.25
Chapters of Twenty-first Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly.	
January, 1925, Mines and Mineral Resources of Sacramento, Monterey and Orange counties-----	.25
April, 1925, Mines and Mineral Resources of Calaveras, Merced, San Joaquin, Stanislaus and Ventura counties-----	.25
July, 1925, Mines and Mineral Resources of Del Norte, Humboldt and San Diego counties-----	.25
October, 1925, Mines and Mineral Resources of Siskiyou, San Luis Obispo and Santa Barbara counties-----	.25
Subscription, \$1.00 in advance (by calendar year, only).	
Chapters of Twenty-second Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly.	
January, 1926, Mines and Mineral Resources of Trinity and Santa Cruz counties-----	.25
April, 1926, Mines and Mineral Resources of Shasta, San Benito and Imperial counties-----	.25
July, 1926, Mines and Mineral Resources of Marin and Sonoma Counties-----	.25
October, 1926, Mines and Mineral Resources of El Dorado and Inyo counties, also report on Minaret District, Madera County-----	.25
Chapters of Twenty-third Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly.	
January, 1927, Mines and Mineral Resources of Contra Costa County; Santa Catalina Island-----	.25
April, 1927, Mines and Mineral Resources of Amador and Solano counties-----	.25
July, 1927, Mines and Mineral Resources of Placer and Los Angeles counties-----	.25
October, 1927, Mines and Mineral Resources of Mono County-----	.25
Chapters of Twenty-fourth Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly.	
January, 1928, Mines and Mineral Resources of Tuolumne County-----	.25
Chapters of State Oil and Gas Supervisor's Report:	
Summary of Operations—California Oil Fields, July, 1918, to March, 1919 (one volume)-----	Free
Summary of Operations—California Oil Fields. Published monthly, beginning April, 1919:	
**April, **May, June, **July, **August, **September, **October, November, **December, 1919-----	Free
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January, February, March, April, May, June, July, August, September, October, November, December, 1923-----	Free
January, February, March, April, May, June, July, August, September, October, November, December, 1924-----	Free
January, February, March, April, May, June, July, August, September, October, November, December, 1925-----	Free
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January, February, March, April, May, June, July, August, September, October, 1927-----	Free

BULLETINS

Asterisks (**) indicate the publication is out of print.

Price

**Bulletin No. 1. A Description of Some Desiccated Human Remains, by Winslow Anderson. 1888, 41 pp., 6 illustrations-----	
**Bulletin No. 2. Methods of Mine Timbering, by W. H. Storms. 1894, 58 pp., 75 illustrations-----	
**Bulletin No. 3. Gas and Petroleum Yielding Formations of Central Valley of California, by W. L. Watts. 1894, 100 pp., 13 illustrations, 4 maps-----	
**Bulletin No. 4. Catalogue of Californian Fossils, by J. G. Cooper, 1894, 73 pp., 67 illustrations. (Part I was published in the Seventh Annual Report of the State Mineralogist, 1887.)-----	
**Bulletin No. 5. The Cyanide Process, 1894, by Dr. A. Scheidel. 140 pp., 46 illustrations-----	
Bulletin No. 6. California Gold Mill Practices, 1895, by E. B. Preston, 85 pp., 46 illustrations-----	\$0.50
**Bulletin No. 7. Mineral Production of California, by Counties for the year 1894, by Charles G. Yale. Tabulated sheet-----	
**Bulletin No. 8. Mineral Production of California, by Counties for the year 1895, by Charles G. Yale. Tabulated sheet-----	
**Bulletin No. 9. Mine Drainage, Pumps, etc., by Hans C. Behr. 1896, 210 pp., 206 illustrations-----	
**Bulletin No. 10. A bibliography Relating to the Geology, Palaeontology and Mineral Resources of California, by Anthony W. Vogdes. 1896, 121 pp.-----	
**Bulletin No. 11. Oil and Gas Yielding Formations of Los Angeles, Ventura and Santa Barbara counties, by W. L. Watts. 1897, 94 pp., 6 maps, 31 illustrations-----	
**Bulletin No. 12. Mineral Production of California, by Counties for 1896, by Charles G. Yale. Tabulated sheet-----	
**Bulletin No. 13. Mineral Production of California, by Counties for 1897, by Charles G. Yale. Tabulated sheet-----	
**Bulletin No. 14. Mineral Production of California, by Counties for 1898, by Charles G. Yale-----	
**Bulletin No. 15. Map of Oil City Fields, Fresno County, by John H. Means. 1899-----	
**Bulletin No. 16. The Genesis of Petroleum and Asphaltum in California, by A. S. Cooper. 1899, 39 pp., 29 illustrations-----	
**Bulletin No. 17. Mineral Production of California, by Counties for 1899, by Charles G. Yale. Tabulated sheet-----	
**Bulletin No. 18. Mother Lode Region of California, by W. H. Storms. 1900, 154 pp., 49 illustrations-----	
**Bulletin No. 19. Oil and Gas Yielding Formations of California, by W. L. Watts. 1900, 236 pp., 60 illustrations, 8 maps-----	
**Bulletin No. 20. Synopsis of General Report of State Mining Bureau, by W. L. Watts. 1901, 21 pp. This bulletin contains a brief statement of the progress of the mineral industry in California for the four years ending December, 1899-----	
**Bulletin No. 21. Mineral Production of California by Counties, by Charles G. Yale. 1900. Tabulated sheet-----	
**Bulletin No. 22. Mineral Production of California for Fourteen Years, by Charles G. Yale. 1900. Tabulated sheet-----	
Bulletin No. 23. The Copper Resources of California, by P. C. DuBois, F. M. Anderson, J. H. Tibbits and G. A. Tweedy. 1902, 282 pp., 69 illustrations, and 9 maps-----	.50
**Bulletin No. 24. The Saline Deposits of California, by G. E. Bailey. 1902, 216 pp., 99 illustrations, 5 maps-----	
**Bulletin No. 25. Mineral Production of California, by Counties, for 1901, by Charles G. Yale. Tabulated sheet-----	
**Bulletin No. 26. Mineral Production of California for the past Fifteen Years, by Charles G. Yale. 1902, Tabulated sheet-----	
**Bulletin No. 27. The Quicksilver Resources of California, by William Forstner. 1903, 273 pp., 144 illustrations, 8 maps-----	
**Bulletin No. 28. Mineral Production of California, for 1902, by Charles G. Yale. Tabulated sheet-----	
**Bulletin No. 29. Mineral Production of California for Sixteen Years, by Charles G. Yale. 1903. Tabulated sheet-----	

BULLETINS—Continued

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**Bulletin No. 30. Bibliography Relating to the Geology, Palaeontology, and Mineral Resources of California, by A. W. Vogdes. 1903, 290 pp.	-----
**Bulletin No. 31. Chemical Analyses of California Petroleum, by H. N. Cooper. 1904. Tabulated sheet.	-----
**Bulletin No. 32. Production and Use of Petroleum in California, by Paul W. Prutzman. 1904, 230 pp., 116 illustrations, 14 maps.	-----
**Bulletin No. 33. Mineral Production of California, by Counties, for 1903, by Charles G. Yale. Tabulated sheet.	-----
**Bulletin No. 34. Mineral Production of California for Seventeen Years, by Charles G. Yale. 1904. Tabulated sheet.	-----
**Bulletin No. 35. Mines and Minerals of California, by Charles G. Yale. 1904, 55 pp., 20 county maps. Relief map of California.	-----
**Bulletin No. 36. Gold Dredging in California, by J. E. Doolittle. 1905, 120 pp., 66 illustrations, 3 maps.	-----
**Bulletin No. 37. Gems, Jewelers' Materials, and Ornamental Stones of California, by George F. Kunz. 1905, 168 pp., 54 illustrations.	-----
**Bulletin No. 38. Structural and Industrial Materials of California, by Wm. Forstner, T. C. Hopkins, C. Naramore and L. H. Eddy. 1906, 412 pp., 150 illustrations, 1 map.	-----
**Bulletin No. 39. Mineral Production of California, by Counties, for 1904, by Charles G. Yale. Tabulated sheet.	-----
**Bulletin No. 40. Mineral Production of California for Eighteen Years, by Charles G. Yale. 1905. Tabulated sheet.	-----
**Bulletin No. 41. Mines and Minerals of California, for 1904, by Charles G. Yale. 1905, 54 pp., 20 county maps.	-----
**Bulletin No. 42. Mineral Production of California, by Counties, 1905, by Charles G. Yale. Tabulated sheet.	-----
**Bulletin No. 43. Mineral Production of California for Nineteen Years, by Charles G. Yale. Tabulated sheet.	-----
**Bulletin No. 44. California Mines and Minerals for 1905, by Charles G. Yale. 1907, 31 pp., 20 county maps.	-----
**Bulletin No. 45. Auriferous Black Sands of California, by J. A. Edman. 1907. 10 pp.	-----
Bulletin No. 46. General Index of Publications of the California State Mining Bureau, by Charles G. Yale. 1907. 54 pp.	\$0.30
**Bulletin No. 47. Mineral Production of California, by Counties, 1906, by Charles G. Yale. Tabulated sheet.	-----
**Bulletin No. 48. Mineral Production of California for Twenty Years. 1906, by Charles G. Yale.	-----
**Bulletin No. 49. Mines and Minerals of California for 1906, by Charles G. Yale. 34 pp.	-----
Bulletin No. 50. The Copper Resources of California, 1908, by A. Hausmann, J. Kruttschnitt, Jr., W. E. Thorne and J. A. Edman, 366 pp., 74 illustrations. (Revised edition.)	1.00
**Bulletin No. 51. Mineral Production of California, by Counties, 1907, by D. H. Walker. Tabulated sheet.	-----
**Bulletin No. 52. Mineral Production of California for Twenty-one Years, 1907, by D. H. Walker. Tabulated sheet.	-----
**Bulletin No. 53. Mineral Production of California for 1907, with County Maps, by D. H. Walker, 62 pp.	-----
**Bulletin No. 54. Mineral Production of California, by Counties, by D. H. Walker, 1908. Tabulated sheet.	-----
**Bulletin No. 55. Mineral Production of California for Twenty-two Years, by D. H. Walker, 1908. Tabulated sheet.	-----
**Bulletin No. 56. Mineral Production for 1908, with County Maps and Mining Laws of California, by D. H. Walker. 78 pp.	-----
**Bulletin No. 57. Gold Dredging in California, by W. B. Winston and Chas. Janin. 1910, 312 pp., 239 illustrations and 10 maps.	-----
**Bulletin No. 58. Mineral Production of California, by Counties, by D. H. Walker, 1909. Tabulated sheet.	-----
**Bulletin No. 59. Mineral Production of California for Twenty-three Years, by D. H. Walker, 1909. Tabulated sheet.	-----

BULLETINS—Continued

Asterisks (** indicate the publication is out of print.	Price
**Bulletin No. 60. Mineral Production for 1909, County Maps and Mining Laws of California, by D. H. Walker. 94 pp.	-----
**Bulletin No. 61. Mineral Production of California, by Counties for 1910, by D. H. Walker. Tabulated sheet	-----
**Bulletin No. 62. Mineral Production of California for Twenty-four Years, by D. H. Walker, 1910. Tabulated sheet	-----
**Bulletin No. 63. Petroleum in Southern California, by P. W. Prutzman. 1912, 430 pp., 41 illustrations, 6 maps	-----
**Bulletin No. 64. Mineral Production for 1911, by E. S. Boalich. 49 pp.	-----
**Bulletin No. 65. Mineral Production for 1912, by E. S. Boalich. 64 pp.	-----
**Bulletin No. 66. Mining Laws of the United States and California. 1914, 89 pp.	-----
**Bulletin No. 67. Minerals of California, by Arthur S. Eakle. 1914, 226 pp.	-----
**Bulletin No. 68. Mineral Production for 1913, with County Maps and Mining Laws, by E. S. Boalich. 160 pp.	-----
**Bulletin No. 69. Petroleum Industry of California, with Folio of Maps (18 by 22), by R. P. McLaughlin and C. A. Waring. 1914, 519 pp., 13 illustrations, 83 figs. [18 plates in accompanying folio.]	-----
**Bulletin No. 70. Mineral Production for 1914, with County Maps and Mining Laws. 184 pp.	-----
**Bulletin No. 71. Mineral Production for 1915, with County Maps and Mining Laws, by Walter W. Bradley. 193 pp., 4 illustrations	-----
Bulletin No. 72. The Geologic Formations of California, by James Perrin Smith. 1916, 47 pp.	\$0.25
**Reconnaissance Geologic Map (of which Bulletin 72 is explanatory), in 23 colors. Scale: 1 inch = 12 miles. Mounted	Free
**Bulletin No. 73. First Annual Report of the State Oil and Gas Supervisor of California, for the fiscal year 1915–16, by R. P. McLaughlin. 278 pp., 26 illustrations	-----
Bulletin No. 74. Mineral Production of California in 1916, with County Maps, by Walter W. Bradley. 179 pp., 12 illustrations	-----
**Bulletin No. 75. United States and California Mining Laws, 1917. 115 pp., paper	-----
Bulletin No. 76. Manganese and Chromium in California, by Walter W. Bradley, Emile Huguenin, C. A. Logan, W. B. Tucker and C. A. Waring, 1918. 248 pp., 51 illustrations, 5 maps, paper	.50
Bulletin No. 77. Catalogue of Publications of California State Mining Bureau, 1880–1917, by E. S. Boalich. 44 pp., paper	Free
Bulletin No. 78. Quicksilver Resources of California, with a Section on Metallurgy and Ore-Dressing, by Walter W. Bradley, 1918. 389 pp., 77 photographs and 42 plates (colored and line cuts), cloth	1.50
Bulletin No. 79. Magnesite in California, by Walter W. Bradley, 1925, 147 pp., 62 photographs, 11 line cuts and maps, cloth	1.00
†Bulletin No. 80. Tungsten, Molybdenum and Vanadium in California. (In preparation)	-----
†Bulletin No. 81. Foothill Copper Belt of California. (In preparation)	-----
**Bulletin No. 82. Second Annual Report of the State Oil and Gas Supervisor, for the fiscal year 1916–1917, by R. P. McLaughlin, 1918. 412 pp., 31 illustrations, cloth	-----
Bulletin No. 83. California Mineral Production for 1917, with County Maps, by Walter W. Bradley. 179 pp., paper	Free
**Bulletin No. 84. Third Annual Report of the State Oil and Gas Supervisor, for the fiscal year 1917–1918, by R. P. McLaughlin, 1918. 617 pp., 28 illustrations, cloth	-----
**Bulletin No. 85. Platinum and Allied Metals in California, by C. A. Logan, 1919. 10 photographs, 4 plates, 120 pp., paper	-----
Bulletin No. 86. California Mineral Production for 1918, with County Maps, by Walter W. Bradley, 1919. 212 pp., paper	Free

† Not yet published.

BULLETINS—Continued

	Price
Asterisks (**) indicate the publication is out of print.	
**Bulletin No. 87. Commercial Minerals of California, with notes on their uses, distribution, properties, ores, field tests, and preparation for market, by W. O. Castello, 1920. 124 pp., paper-----	
Bulletin No. 88. California Mineral Production for 1919, with County Maps, by Walter W. Bradley, 1920. 204 pp., paper-----	Free
**Bulletin No. 89. Petroleum Resources of California, with Special Reference to Unproved Areas, by Lawrence Vander Leck, 1921. 12 figures, 6 photographs, 6 maps in pocket, 186 pp., cloth-----	
Bulletin No. 90. California Mineral Production for 1920, with County Maps, by Walter W. Bradley, 1921. 218 pp., paper-----	Free
Bulletin No. 91. Minerals of California, by Arthur S. Eakle, 1923, 328 pp., cloth-----	\$1.00
Bulletin No. 92. Gold Placers of California, by Chas. S. Haley, 1923. 167 pp., 36 photographs and 7 plates (colored and line cuts, also geologic map), cloth-----	1.50
Extra copies of the Geologic Map (in 4 colors)-----	.50
Bulletin No. 93. California Mineral Production for 1922, by Walter W. Bradley, 1923, 188 pp., paper-----	Free
Bulletin No. 94. California Mineral Production for 1923, by Walter W. Bradley, 1924, 162 pp., paper-----	Free
Bulletin No. 95. Geology and Ore Deposits of the Randsburg Quadrangle, by Carlton D. Hulin, 1925. 152 pp., 49 photographs, 13 line cuts, 1 colored geologic map, cloth-----	2.00
Bulletin No. 96. California Mineral Production for 1924, by Walter W. Bradley, 1925. 173 pp., paper-----	Free
Bulletin No. 97. California Mineral Production for 1925, by Walter W. Bradley, 1926. 172 pp., paper-----	Free
Bulletin No. 100. California Mineral Production for 1926, by Walter W. Bradley, 1927. 174 pp., paper-----	Free

PRELIMINARY REPORTS

Asterisks (**) indicate the publication is out of print.	
**Preliminary Report No. 1. Notes on Damage by Water in California Oil Fields, December, 1913. By R. P. McLaughlin. 4 pp.-----	
**Preliminary Report No. 2. Notes on Damage by Water in California Oil Fields, March, 1914. By R. P. McLaughlin. 4 pp.-----	
Preliminary Report No. 3. Manganese and Chromium, 1917. By E. S. Boalich. 32 pp.-----	Free
Preliminary Report No. 4. Tungsten, Molybdenum and Vanadium. By E. S. Boalich and W. O. Castello, 1918. 34 pp. Paper-----	Free
Preliminary Report No. 5. Antimony, Graphite, Nickel, Potash, Strontium and Tin. By E. S. Boalich and W. O. Castello, 1918. 44 pp. Paper-----	Free
**Preliminary Report No. 6. A Review of Mining in California During 1919. Fletcher Hamilton, 1920. 43 pp. Paper-----	
**Preliminary Report No. 7. The Clay Industry in California. By E. S. Boalich, W. O. Castello, E. Huguenin, C. A. Logan, and W. B. Tucker, 1920. 102 pp. 24 illustrations. Paper-----	
**Preliminary Report No. 8. A Review of Mining in California During 1921, with Notes on the Outlook for 1922. Fletcher Hamilton, 1922. 68 pp. Paper-----	

MISCELLANEOUS PUBLICATIONS

Asterisks (**) indicate the publication is out of print.	
**First Annual Catalogue of the State Museum of California, being the collection made by the State Mining Bureau during the year ending April 16, 1881. 350 pp.-----	
**Catalogue of books, maps, lithographs, photographs, etc., in the library of the State Mining Bureau at San Francisco, May 15, 1884. 19 pp.-----	
**Catalogue of the State Museum of California, Volume II, being the collection made by the State Mining Bureau from April 16, 1881, to May 5, 1884. 220 pp.-----	

MISCELLANEOUS PUBLICATIONS—Continued

	Price
**Catalogue of the State Museum of California, Volume III, being the collection made by the State Mining Bureau from May 15, 1884, to March 31, 1887. 195 pp.	-----
**Catalogue of the State Museum of California, Volume IV, being the collection made by the State Mining Bureau from March 30, 1887, to August 20, 1890. 261 pp.	-----
**Catalogue of the Library of the California State Mining Bureau, September 1, 1892. 149 pp.	-----
**Catalogue of West North American and Many Foreign Shells with Their Geographical Ranges, by J. G. Cooper. Printed for the State Mining Bureau, April, 1894.	-----
**Report of the Board of Trustees for the four years ending September, 1900. 15 pp. Paper	-----
Bulletin. Reconnaissance of the Colorado Desert Mining District. By Stephen Bowers, 1901. 19 pp. 2 illustrations. Paper	Free
Commercial Mineral Notes. A monthly mimeographed sheet, beginning April, 1923	Free

MAPS

Register of Mines With Maps.

Asterisks (**) indicate out of print.

**Register of Mines, with Map, Amador County	-----
**Register of Mines, with Map, Butte County	-----
**Register of Mines, with Map, Calaveras County	-----
**Register of Mines, with Map, El Dorado County	-----
**Register of Mines, with Map, Inyo County	-----
**Register of Mines, with Map, Kern County	-----
**Register of Mines, with Map, Lake County	-----
**Register of Mines, with Map, Mariposa County	-----
**Register of Mines, with Map, Nevada County	-----
**Register of Mines, with Map, Placer County	-----
**Register of Mines, with Map, Plumas County	-----
**Register of Mines, with Map, San Bernardino County	-----
**Register of Mines, with Map, San Diego County	-----
Register of Mines, with Map, Santa Barbara County (1906)	\$0.25
**Register of Mines, with Map, Shasta County	-----
**Register of Mines, with Map, Sierra County	-----
**Register of Mines, with Map, Siskiyou County	-----
**Register of Mines, with Map, Trinity County	-----
**Register of Mines, with Map, Tuolumne County	-----
Register of Mines, with Map, Yuba County (1905)	.25
Register of Oil Wells, with Map, Los Angeles City (1906)	.35

OTHER MAPS

Asterisks (**) indicate the publication is out of print.

**Map of California, Showing Mineral Deposits (50 x 60 in.)	-----
**Map of Forest Reserves in California	-----
**Mineral and Relief Map of California	-----
**Map of El Dorado County, Showing Boundaries, National Forests	-----
**Map of Madera County, Showing Boundaries, National Forests	-----
**Map of Placer County, Showing Boundaries, National Forests	-----
**Map of Shasta County, Showing Boundaries, National Forests	-----
**Map of Sierra County, Showing Boundaries, National Forests	-----
**Map of Siskiyou County, Showing Boundaries, National Forests	-----
**Map of Tuolumne County, Showing Boundaries, National Forests	-----
**Map of Mother Lode Region	-----
**Map of Desert Region of Southern California	-----
Map of Minaret District, Madera County	.20
Map of Copper Deposits in California	.05
**Map of Calaveras County	-----
**Map of Plumas County	-----
**Map of Trinity County	-----

OTHER MAPS—Continued

	Price
**Map of Tuolumne County.	
Geological Map of Inyo County. Scale 1 inch equals 4 miles.	\$0.60
Map of California accompanying Bulletin No. 89, showing generalized classification of land with regard to oil possibilities. Map only, without Bulletin	.25
**Geological Map of California, 1916. Scale 1 inch equals 12 miles. As accurate and up-to-date as available data will permit as regards topography and geography. Shows railroads, highways, post offices and other towns. First geological map that has been available since 1892, and shows geology of entire state as no other map does. Geological details lithographed in 23 colors. Mounted.	-----
Topographic Map of Sierra Nevada Gold Belt, showing distribution of auriferous gravels, accompanying Bulletin No. 92 (also sold singly) In 4 colors	.50

OIL FIELD MAPS

These maps are revised from time to time as development work advances and ownerships change.

Map No. 1—Sargent, Santa Clara County	.50
Map No. 2—Santa Maria, including Cat Canyon and Los Alamos	.75
Map No. 3—Santa Maria, including Casmalia and Lompoc	.75
Map No. 4—Whittier-Fullerton, including Olinda, Brea Canyon, Puente Hills, East Coyote and Richfield	.75
Map No. 5—Whittier-Fullerton, including Whittier, West Coyote, and Montebello	.75
Map No. 6—Salt Lake, Los Angeles County	.75
Map No. 7—Sunset and San Emido and Kern County	.75
Map No. 8—South Midway and Buena Vista Hills, Kern County	.75
Map No. 9—North Midway and McKittrick, Kern County	.75
Map No. 10—Belridge and McKittrick, Kern County	.75
Map No. 11—Lost Hills and North Belridge, Kern County	.75
Map No. 12—Devils Den, Kern County	.75
Map No. 13—Kern River, Kern County	.75
Map No. 14—Coalinga, Fresno County	1.00
Map No. 15—Elk Hills, Kern County	.75
Map No. 16—Ventura-Ojai, Ventura County	.75
Map No. 17—Santa Paula-Sespe Oil Fields, Ventura County	.75
Map No. 18—Piru-Simi-Newhall Oil Fields	.75
Map No. 19—Arroyo Grande, San Luis Obispo County	.75
Map No. 20—Long Beach Oil Field	1.25
Map No. 21—Portion of District 4, Showing Boundaries of Oil Fields, Kern and Kings counties	.75
Map No. 22—Portion of District 3, Showing Oil Fields, Santa Barbara County	.75
Map No. 23—Portion of District 2, Showing Boundaries of Oil Fields, Ventura County	.75
Map No. 24—Portion of District 1, Showing Boundaries of Oil Fields, Los Angeles and Orange counties	.75
Map No. 26—Huntington Beach Oil Field	.75
Map No. 27—Santa Fe Springs Oil Field	.75
Map No. 28—Torrance, Los Angeles County	.75
Map No. 29—Dominguez, Los Angeles County	.75
Map No. 30—Rosecrans, Los Angeles County	.75
Map No. 31—Inglewood, Los Angeles County	.75
Map No. 32—Seal Beach, Los Angeles and Orange Counties	.75

DETERMINATION OF MINERAL SAMPLES

Samples (limited to three at one time) of any mineral found in the state may be sent to the Division of Mines and Mining for identification, and the same will be classified free of charge. No samples will be determined if received from points outside the state. It must be understood that no assays, or quantitative determinations will be made. Samples should be in lump form if possible, and marked plainly with name of sender on outside of package, etc. No samples will be received unless delivery charges are prepaid. A letter should accompany sample, giving locality where mineral was found and the nature of the information desired.

STATE OF CALIFORNIA
DIVISION OF MINES AND MINING
CORDIALLY INVITES YOU TO VISIT
ITS VARIOUS DEPARTMENTS MAINTAINED
FOR THE PURPOSE OF FURTHERING
THE DEVELOPMENT OF THE
MINERAL RESOURCES OF CALI-
FORNIA

At the service of the public are the scientific reference library and reading room, the general information bureau, the laboratory for the free determination of mineral samples found in the state, and the largest museum of mineral specimens on the Pacific Coast. The time and attention of the State Mineralogist, as well as that of his technical staff, are also at your disposal.

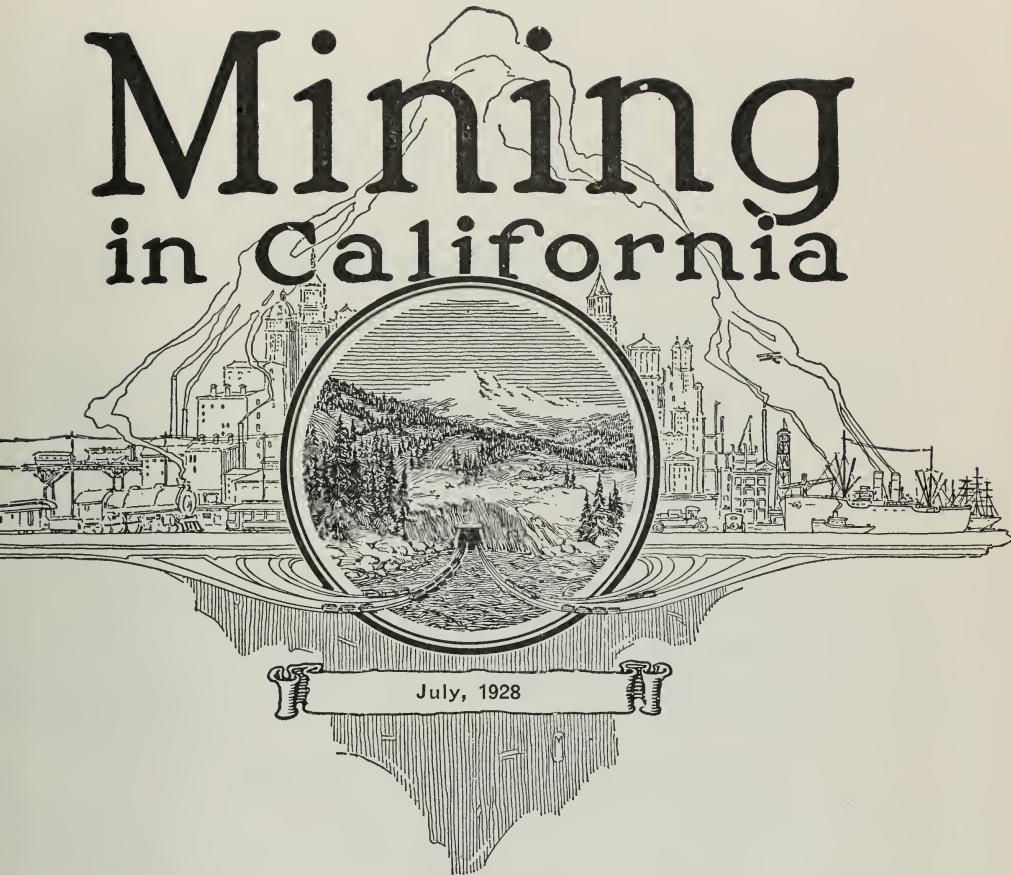
Office hours: 9 a.m. to 5 p.m. daily.

Saturday, 9 a.m. to 12 m.

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State Mineralogist.

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Branch Offices: New Orpheum Building, Los Angeles; Capitol Extension Building (mail address, P. O. Box 1208), Sacramento; Bank of Italy Building, Bakersfield; Taft, Coalinga, Santa Maria, and Santa Paula.

Mining in California



July, 1928

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FERRY BUILDING
SAN FRANCISCO

DIVISION OF MINES AND MINING

EXECUTIVE AND TECHNICAL STAFF

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WALTER W. BRADLEY

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NOTE.—A detailed report of the activities of the Department of Petroleum and Gas is issued monthly by the Division of Mines and Mining, entitled 'Summary of Operations, California Oil Fields.'

STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINES AND MINING
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No. 3

CHAPTER OF
**REPORT XXIV OF THE STATE
MINERALOGIST**

COVERING
MINING IN CALIFORNIA

AND THE
**ACTIVITIES OF THE DIVISION OF MINES
AND MINING**



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State of California
DIVISION OF MINES AND MINING

LLOYD L. ROOT
STATE MINERALOGIST

OUTLINE MAP
OF
CALIFORNIA

SCALE



•LEGEND•

- Mining Division Boundaries.
- Mining Division Offices.

MEXICO

PREFACE

The Division of Mines and Mining (formerly State Mining Bureau) is maintained for the purpose of assisting in all possible ways in the development of California's mineral resources.

As one means of offering tangible service to the mining public, the State Mineralogist for many years has issued an annual or a biennial report reviewing in detail the mines and mineral deposits of the various counties.

The weak point in work of this character has been that the results of field investigations were so long in preparation that they had lost much of their usefulness by the time they finally appeared in print.

As a progressive step in advancing the interests of the mineral industry, publication of the Annual Report of the State Mineralogist in the form of monthly chapters was begun in January, 1922, and continued until March, 1923.

Owing to a lack of funds for printing this was changed to quarterly publication, beginning in September, 1923.

For the same reason, beginning with the January, 1924, issue, it has been necessary to charge a subscription price of \$1 per calendar year, payable in advance; single copies, 25 cents apiece. 'Mining in California' will continue to be sent without charge to our exchange list, including schools and public libraries, as are also other publications of the Division of Mines and Mining.

Pages are numbered consecutively throughout the year and an index to the complete reports is included annually in the closing number.

Such a publication admits of several improvements over the old method of procedure. Each issue contains a report of the current development and mining activities of the state, prepared by the district mining engineers. Special articles dealing with various phases of mining and allied subjects by members of the staff and other contributors are included. Mineral production reports formerly issued only as an annual statistical bulletin are published herein as soon as returns from producers are compiled. The executive activities, and those of the laboratory, museum, library, employment service and other features with which the public has had too little acquaintance also are reported.

While current activities of all descriptions will be covered in these chapters, the practice of issuing from time to time technical reports on special subjects will be continued, as well. A list of such reports now available is appended hereto, and the names of new bulletins will be added in the future as they are completed.

The chapters will be subject to revision, correction and improvement. Constructive suggestions from the mining public will be gladly received, and are invited.

The one aim of the Division of Mines and Mining is to increase its usefulness and to stimulate the intelligent development of the wonderful, latent resources of the State of California.

DISTRICT REPORTS OF MINING ENGINEERS

In 1919-1920 the Mining Department was organized into four main geographical divisions, with the field work delegated to a mining engineer in each district, working out from field offices that were established in Redding, Auburn, San Francisco and Los Angeles, respectively. This move brought the office into closer personal contact with operators, and it has many advantages over former methods of conducting field work. In 1923 the Redding and Auburn field offices were consolidated and moved to Sacramento.

The Redding office was reestablished in 1928, and the boundaries of each district adjusted. The counties now included in each of the four divisions, and the locations of the branch offices, are shown on the accompanying outline map of the state. (Frontispiece.)

Reports of mining activities and development in each division, prepared by the district engineer, will continue to appear under the proper field division heading.

Although the petroleum industry is but little affiliated with other branches of mining, oil and gas are among the most valuable mineral products of California, and a report by the State Oil and Gas Supervisor on the current development and general conditions in the state's oil fields is included under this heading.

New County Reports

The series of separate reports on the mines and mineral resources of the different counties, that together comprise the State Mineralogist's Reports XIV to XVII, inclusive, in the case of many of the counties have become exhausted. Those still in stock are in need of revision. It was deemed advisable, therefore, beginning with the January, 1925, issue of 'Mining in California,' to make the district engineers' reports in the form of a complete general report on the mines and mineral resources in one or more of the counties in each district.

This program will be followed as near as possible in succeeding numbers of the quarterly until each county in the state has been covered.

SACRAMENTO FIELD DIVISION

C. A. LOGAN, Mining Engineer.

BUTTE COUNTY

Geography

The western half of Butte County lies in the Sacramento Valley and is entirely an agricultural region, while to the north and east of Oroville the foothills rise into mountain ridges several thousand feet high, separated by deep canyons occupied by the forks of Feather River.

The Southern Pacific Railroad's Shasta Route traverses the western or valley portion from north to south, with a branch through Honcut to Oroville, and another from Chico to Stirling City via Magalia. The Western Pacific Railway, entering Oroville from the south, follows the canyon of the North Fork of Feather River northeastward into Plumas County. The Sacramento Northern, an electric short line, runs from Sacramento north to Oroville Junction, with branches to Chico and Oroville. The county is adequately covered by a network of good roads.

Mineral Resources

The placer gold production has been heavy, and the complete record would show several times the amount in the table, as the surface placers worked in the early days were extremely rich. An estimate of \$200,000,000 total gold output has been made, but there are no definite figures previous to 1880 to support this except for the Cherokee (Spring Valley) Mine. Gold quartz has yielded a few million. Next in importance has been the stone industry, in this county a by-product of gold dredging; mineral water, chromite, manganese, silver, platinum group metals, brick, lime, soapstone and mineral paint have each been produced in smaller quantities. Several hundred diamonds have been found during placer mining.

Water, Power and Timber

The drift mines in general develop from their own workings enough water for washing the small tonnages of gravel mined, and quartz mines generally have enough for milling. There is not enough water available for direct use for power, in many cases, and what there is that could be used for this purpose, is too costly, particularly in the case of the supply in the Forbestown Mining district, where the Oroville-Wyandotte Irrigation district controls the supply and charges a high price. The supply for surface placer mining is limited. The water formerly used for hydraulic mining has been taken by power companies and farmers. Pacific Gas & Electric Company operates two hydroelectric plants at De Sabla and Centerville on Big Butte Creek. Great Western Power Company of California has a large generating plant at Las Plumas.

There is a good supply of timber for mining in all of the mining districts.

Acknowledgment

The writer wishes to acknowledge with pleasure the assistance given by mine owners and operators. Special thanks are due to M. J. Cooney and George A. White, Forbestown; E. N. Understock and Nat Lambert, De Sabla; H. Bartram, Coutolenc; R. L. Phillips and A. H. Rugh, Nimshev; J. A. Moore, Maurice Reich, J. A. Pitts and Charles Bader, Magalia; John Wells and Sidney Wellington, Yankee Hill; Mr. and Mrs. Carl Johnson, Berry Creek; Howard Silsbee, Mountain House; A. Delerey, Paradise; Harry Sheehy and Forest Snow, Berdan, and G. F. Skelton, Chico.

MINERAL PRODUCTION OF BUTTE COUNTY, 1880-1927.

Year	Diamonds, value	Gold, value	Mineral water		Platinum		Silver, value	Miscellaneous stone ¹ , value	Miscellaneous and unapportioned		
			Gallons	Value	Ounces	Value			Amount	Value	Substance
1880		\$430,501						\$1,247			
1881		650,000						1,000			
1882		650,000									
1883		630,000									
1884		680,000									
1885		672,569						3,700			
1886		728,160						13			
1887		632,902						6			
1888		550,000						500			
1889		696,628						518			
1890		268,977						5,815			
1891		304,765						229			
1892		316,999						610			
1893		307,351						5,504			
1894		473,673									
1895		697,261						8,936			
1896		749,316	1,900	\$775				5,390			
1897		667,025	2,160	900				7,885			
1898		514,508	2,685	900				9,317			
1899		486,846	2,480	1,240				5,009			
1900		485,589	15,000	1,515				13,082			
1901		864,978	10,400	1,455				4,634			
1902		916,782	14,000	1,500				2,219			
1903		1,571,507	13,000	1,550	14	\$210		358			
1904		1,932,552	12,600	1,512	66	1,000		2,302			
1905		2,607,500	15,000	1,500	110	1,770		7,134			
1906		3,016,747	19,500	1,950	26	475		10,853			
1907		2,786,840	21,400	2,140				8,967			
1908		3,139,398	22,450	2,450				12,708	\$7,916		
1909		2,987,079	25,400	1,400				7,205			
1910		2,487,791						32,140			
1911	\$150	2,323,396						6,429	34,932		
1912		2,346,229						5,102	78,208		
1913	175	2,269,849	1,000	250				5,567	51,879		
1914	100	1,700,000	1,200	300	119	381		5,163	258,503		
1915	300	1,545,976	5,000	850	126	3,997		4,000	50,895		
1916	357	1,257,231	3,150	1,125	76	3,472		3,433	67,143		
1917	125	922,271	3,500	1,450	119	9,106		3,332	67,892		
1918	125	645,975	3,900	1,680	114	7,723		2,991	89,870		
1919	378,297	6,532	2,388	33	5,071	1,911		2,410	77,822		
1920	400	467,900	6,400	5,200	fine oz.	42		2,253			
1921	331	456,760	2,900	4,100	31	2,432		1,750	203,900		
1922	225	491,201	2,835	2,485	fine oz.	30		1,890	220,450		
1923		487,393	3,700	3,300	fine oz.	19		1,756	340,250		
1924		484,530	6,000	4,500	fine oz.	20		2,118	138,000		
1925		355,289	4,484	2,742	fine oz.	56		4,354	156,738		
1926	175	287,853			fine oz.	10		2,997	147,604	273 M.	
1927		143,494						371		{ 40 lbs. 130 lbs.	
Totals		\$2,463	\$30,467,888	339,676	\$51,157	1,011	\$63,168	\$182,606	\$2,116,907		\$645,865

¹Includes crushed rock, rubble, rip-rap, sand, gravel.

²See under "Unapportioned."

³Includes diamonds, natural gas, soapstone.

⁴Includes natural gas and soapstone.

⁵Includes brick, copper, gems (diamonds), lead, natural gas, soapstone.

⁶Includes clay (pottery), mineral water, natural gas, soapstone.

CHROMITE¹

Chromite was found in many parts of the county between 1915 and 1918, as shown by the following tabulation, which is abstracted from our Bulletin 76, to which the reader is referred for fuller details, as there has been practically no new development in this branch of mining since 1919, and all are idle now.

The mines along the flanks of the Magalia ridge as far north as Stirling City are within hauling distance of the railroad. The deposits there are generally in the canyons where erosion has cut through the lava and soil cover and has exposed the serpentine, which occurs in lenses striking generally northwest, and carrying chromite either in bunches or as disseminated ore, the latter requiring concentration.

In the eastern part of the county, there is no lava covering. A large serpentine area is traversed by North Fork of Feather River north of Big Bend and there are other occurrences near Mountain House, Quartz Hill, three to six miles east of Forbestown and in the extreme southeast part of the county.

Table of Chromite Properties in Butte County

Name	Sec.	Location Twp.	Range	Nearest R. R. shipping point and distance
Agard & Stewart	36	23	4	1 mile Pulga
Curtis	7	21	4	Oroville
Dowden				15 miles Blinzig
Hendricks	34	22	4	Oroville
Hendricks No. 2	6	21	4	Oroville
Lambert	34	23	3	5 miles Magalia
Lucky Strike		Woodleaf		30 miles Oroville
Dickie & Dreisbach		Clipper Mills		30 miles Oroville
Noyes				
Rohrer & McCroskey	36	23	4	28 miles Oroville
Sharrer	10	19	7	30 miles Oroville
Simmons				
Stokes				
Swayne				
Union Chrome				
Wakeham	35	23	3	19 miles Oroville
Wells Mine				
Zenith	6	19	7	26 miles Oroville

CLAY

Lund Brick Plant. N. E. Lund, 290 Villa Street, Oroville, owner and operator. The plant and pit are 3.7 miles east of Coxlane spur on the Southern Pacific Railroad between Palermo and Honcut. The deposit is of interest because the clay being used overlies an auriferous gravel channel, and the removal of clay will facilitate the working of the gravel which first attracted the owner.

The following is a section of the deposit:

2 feet soil and gravel overburden.

5-6 feet red mottled sandy clay (fat).

5-6 feet red mottled sandy clay (leaner).

26 feet light sandy clay (decomposed sand).

? gold bearing channel, depth unknown, containing fine and coarse red gravel and large boulders, with a good deal of quartz.

Lund's first work was to sink five shafts averaging 40 feet deep to gravel; there are 10 such shafts in all, which were stopped before reaching bedrock by the influx of water. An adit was run 580 feet in

¹ Cal. State Min. Bur. Bull. 76, pp. 118-121; 216.

rim gravel without reaching the channel trough, and was lost by caving. A good prospect is reported.

Clay is dug with a dragline scraper, raised by bucket elevator to rolls, then elevated to a bin from which it goes to pug mill, auger machine and cutter. A set of tunnel driers has been built lately, requiring $2\frac{1}{2}$ days for steam drying or four days by air circulation alone. There is also an outside drier. The capacity of machinery is 20 M daily. Oil fuel and steam power are used.

The different strata of clay have to be mixed to obtain a good red brick of pleasing color. Roofing granules are made from waste. Three shades of this, called cherry, light red and blue-red are sold. Bricks are burned in field kilns.

Professor W. F. Dietrich reported tests on material from this property and discussed its ceramic qualities in Bulletin 99 of this Division, recently published.

Table Mountain Clay Products Company has a brick plant at Thermalito and 40 acres of clay land 6 miles distant in SW $\frac{1}{4}$ Sec. 22, T. 20 N., R. 3 E., on the Oroville-Pentz highway. L. F. Riley, president and manager. Frank Terrill, superintendent.

The plant has a capacity of 20,000 brick daily. Roofing tile and partition tile are made, as well as common and rug brick. The brick are of a pleasing shade, lighter than commonly seen, and of good quality.

The clay pit carries a thin basaltic capping and about 6 feet of grey volcanic mud, burning dark red. This is underlain by light-colored clay of the Ione formation, of which 4 feet is pure white. It was prospected by auger holes up to 22 feet deep and in one place 72 feet.

It is mined with scrapers and hauled to the plant in three trucks, where it is dumped to the dry pan and elevated to a bin; that coarser than 60-mesh is returned to the pan. It is worked in an auger machine and bricks are cut by hand. After drying in the sun about two weeks, bricks are burned 6 days in oil-fired field kilns of 185,000 bricks each. Machinery is operated by electric power. The plant is served by Sacramento Northern Railway.

The ceramic qualities of a sample of clay from this property were tested, and discussed by Professor W. F. Dietrich in our Bulletin 99, recently published.

COPPER

A little cement copper was produced from the concentrate at the Gold Bank Mine after chlorination. The ores of the Bonanza King prospect and the Evening Star claim (which see) carry copper, as do others noticed, but no production of this metal is being made.

FUELS

Lignite has been found in the Oroville district in wells drilled for water and oil. This lignite occurs in association with the Ione formation, which borders the foothills on the east and northeast sides of the valley. In geologic mode of occurrence it is similar to that found at Ione, Amador County, and Lincoln, Placer County, where lignite occurs interbedded in nearly horizontal, saucer-shaped bodies in clay and sand at depths seldom over 125 feet below the present surface,

Natural gas in small amount has been produced from a single well in this county.

Lott Ranch. C. F. Lott, owner, Oroville. This property is $8\frac{1}{2}$ miles by road from Oroville in Sec. 12, T. 20 N., R. 3 E., in Coal Canyon, at an elevation of 500 feet. There are reported to be two strata of brown lignite at depths of 20 and 30 feet below the surface, but the old workings were obliterated by a washout and slide several years ago and the beds in place underground are not now accessible, although there is considerable lignite in the old dumps.

Between 1860 and 1880 this lignite was used in Oroville for fuel and for making gas. There is no one now alive in the neighborhood who knows the extent of the underground workings, but an old report¹ states the coal was about six feet thick and was drifted for "several hundred feet." A sample taken in 1920 by the writer from the old dump was too much oxidized to permit any test of its properties.

GEMS

Californite (California Jade) occurs at the Jade Mountain Mines near Pulga, on the Western Pacific Railway in the canyon of North Fork of Feather River. Some work has been done upon the property and an attractive exhibit was made at the last State Fair. J. R. Grant, 418 Turk Street, San Francisco, manager. W. H. King, Pulga, secretary.

Diamonds have been found at intervals from the early days in the placer mines of Cherokee and Morris Ravine and these finds have continued up to the present time, although mining has almost ceased there. Eakle stated² in 1922 that more than 300 good diamonds have been obtained from the placers of the Cherokee district. All were accidental finds in the course of washing the gold-bearing gravel. The source of these diamonds has not been found. The United States Diamond Mining Company prospected some ground unsuccessfully in an effort to find the stones in place some years ago. Though diamonds have been found at times at placer mines in seven other counties, the number found at Cherokee has evidently exceeded all the others combined. They weighed usually up to one carat, but some larger ones were up to two carats in weight. A good many were 'off color.'

GOLD (QUARTZ MINES)

The quartz mines of the Forbestown district and of Big Bend Mountain, which have been the most important so far found in the county, occur in greenstone mapped geologically as amphibolite schist, comprising rocks principally of basic igneous character, which have been dynamically altered, changing largely to schists. The influence of the great granodiorite and granite batholith lying between these two districts, and which is bordered by other scattered mines, was probably important in the genesis of the ores, though no important mines have been found here in the granite.

The bedrock formations in the entire western half, and more, of the county are covered, except where reached by erosion, so little can be judged of their character. From observations made by the writer in several drift mine workings, and in the canyons of some of the

¹ Cal. State Min. Bur. R. XI, p. 166.

² Cal. State Min. Bur. Bull. 91, p. 8.

streams, it appears that the slates and schists of the Calaveras (Carboniferous) series with accompanying basic dikes and serpentine follow their normal strike northwest, with dip to the northeast, across the Magalia and neighboring ridges, and that the Mariposa (Jurassic) slate occurs to the southwest of that series. The identification of these rocks, as far as it went, was made solely on the striking similarity, lithologically, of the rocks found here to those of these series in the Mother Lode counties. Gold-bearing stringers and pocket deposits in these rocks have furnished the gold which has enriched the old stream channels crossing them. This is certain because all but one or two of these channels now being worked as drift mines carry little rock except greenstone, slate and serpentine, and these channels are nearly all manifestly too small and too short to have reached back into the granite forming the core of the mountains from the vicinity of Stirling City northward. The term 'dike' has been applied to several of these gold-bearing rock series whose courses can be traced at intervals, where the removal of the lava cover reveals them. The channels, flowing southwest, offer interesting evidence of earth movements along the dikes. Nearly every drift mine that has been opened between West Branch of Feather River and Big Chico Creek shows faults that have occurred since the deposition of the gravel, where the channels cross the 'dikes.' In all cases mentioned except one, there is an apparent upthrow on the downstream (southwest) side or a downthrow on the northeast amounting to a displacement of from a few feet to 225 feet, the latter observed at the Black Diamond and Dix Mines (which see).

Associated with the Calaveras and allied rocks are many large quartz veins, which must be in the main 'spotted,' barren or low grade, as no mines of importance have been developed in them in the Magalia or nearby districts. They resemble, and are probably the same in origin as the 'bull quartz' veins of the Mother Lode.

One thing distinguished the quartz mines of the county from those farther south. In Butte County the gold is mostly in the sulphides, and little has been recovered by amalgamation, in the principal mines. A large quartz vein showing little sulphide is apt to be very low grade. Copper sulphides are usually present in small amount. There has been a tendency for sulphides to occur in bunches, rather than scattered through the quartz evenly.

Berry Creek Mine containing 80 acres in the E $\frac{1}{2}$ of E $\frac{1}{2}$ of Sec. 28, T. 21 N., R. 5 E., on the Oroville-Quincy highway. Berry Creek station on the Western Pacific Railway is about four miles northwest by road. Elevation, 1900 feet.

The property was worked by C. J. Willett et al., and later by John Kinkaid, and ore was crushed in a 1-stamp mill. It was worked by open cut and a series of short adits on the steep mountain side above (east) of the road, previous to 1910. The present owner, Carl Johnson, Oroville (star route), has driven a new adit 100 feet lower than the lowest old work and this is 175 feet long, with the face in hard granodiorite and with an estimated distance of about 100 feet to go to be directly below the point where pay was found in the adit from the road level. The old workings are caved and inaccessible, and statements as to the size of the vein are conflicting. The ore is variously stated to be from a few inches to five feet wide. It was good grade, several

hundred tons yielding a reported average value of \$10 a ton on the plates under obviously wasteful milling, with high loss in the tailing; besides this, bunches of rich pocket ore yielded many thousands of dollars. The total output is estimated at from \$30,000 to \$80,000.

Beginning at the highest workings, there is first an open cut 65 feet long. Seventy feet lower an adit was run, a stope was worked and a drift advanced on the vein from which ore was being taken when the drift was lost by caving from the stope. A winze 20 feet below this level is said to be in pay ore. The adit from the road level is reported to be 200 feet long, with pay ore in a cross vein 15 to 20 feet back from the 2-foot vein which was struck about 70 feet from the portal.

Besides the narrower pay vein which strikes northwest and dips southwest, a wide vein of quartz striking N. 25° E. and dipping east, outercrops on the hillside east of the road. It has been prospected only for pockets. The surface of the hillside pans small quantities of free gold in many places.

Equipment consists of 1-drill compressor, jackhammer drill, gasoline engine and 1-stamp mill, the mill requiring a new building. A water ditch supplying free water crosses the property 80 feet above the lowest adit, as does also the Butte and Plumas Railroad. There are two good houses on the place.

Bloomer Hill (Chambers) Mine comprises 166 $\frac{2}{3}$ acres in NE $\frac{1}{4}$ Sec. 35, T. 21 N., R. 4 E., on Bloomer Hill one mile from Bloomer station on Western Pacific Railway. The railway and North Fork of Feather River cross one corner of the property. Erminie Chambers, owner, Oroville.

The deposit consists of disseminated sulphides and siliceous replacement in amphibolite schist with later oxidation, leaching and kaolinization in the upper section. The schist is derived from earlier igneous rocks, including some porphyry. The footwall of unaltered schistose porphyry strikes N. 20° W. and dips 50° E. Local jointing or movement planes may have been the lines from which the rock masses were acted upon.

The development consists of three adits, two raises and a sub-level. No. 1 adit, said to be 100 feet long and 75 feet below the surface at the face, was not visited. It is said to be all in ore. No. 2 open cut and adit crossecuts the formation for about 125 feet, N. 60° E. at an elevation of 1200 feet. Here an inspection shows mineralized schist, partly leached and kaolinized, with some cores of less mineralized rock. There are three short drifts off this level. The late A. B. Chambers, the former owner and operator, stated that ore milled from one of these averaged over \$6 in free gold, and that the entire distance of this crossecut averaged \$2.50 to \$3 a ton. This level is 125 feet below the outcrop at the face. In this adit 40 feet from the portal, an inclined winze connects with a sub-level 120 feet deeper and with No. 3 adit 200 feet vertically below No. 2. The sub-level, about 100 feet long, shows the fresh, hard mineralized schist unaffected by leaching or kaolinization. No. 3 adit is about 600 feet long, but did not reach ore.

About 1900 the property was equipped with a 15-stamp mill and 4-drill air compressor just below No. 3 adit. Water for power and milling was brought 11 miles from Berry Creek by a ditch which cost over \$35,000 and a steel pipe line which gave over 700 feet fall at the

mill. Only ore from development work had been milled when the mill and other buildings except the compressor house were destroyed by a forest fire. Several of the buildings were replaced but the mill still lies on the ground and the mine has remained idle for 12 years or more.

Burlington Prospect. Owner, Burlington Gold Mining Company, c/o Mrs. W. C. Ralston, 430 California Street, San Francisco. Comprises lots 54 and 56 in Secs. 3 and 10, T. 19 N., R. 6 E., containing 43.18 acres, near Forbestown.

A vein reported to be six feet wide has been prospected by the Joe adit, 635 feet long, which gives 170 feet of backs at the face. Some ore is reported in this. The Annette adit, about 300 feet long, did not develop ore. This property has been idle a number of years.

Carlisle Mine covers 600 acres, patented, and 40 acres unpatented, all in Sec. 35, T. 20 N., R. 6 E., one to two miles north of Forbestown. Owners, heirs of Mrs. Rose H. Hazelton, and Wm. Denman, San Francisco.

The Carlisle, Big Betsy and Indian Gulch veins occur here. The formations are granodiorite and amphibolite schist, the contact crossing the section almost diagonally in a northeasterly direction. The South Fork of Feather River has cut a deep canyon across the south half making conditions favorable for prospecting the Carlisle vein by adits. Carlisle vein has been developed by a winze 200 feet deep with three drifts 100 to 110 feet long northeast and one 315 feet long southwest on the vein, opening it for a total length of 425 feet on the 200-foot level. The vein dips 60° northwest. The adit from which the winze was sunk is on the north bank near the river level, and the drift southwest was carried under the river. The vein is reported six to eight feet wide.

A 10-stamp mill was placed on the south bank of the river and connected with the Carlisle workings by tramway, and ore from a small stope above the adit level, as well as that from development, was milled. The ore carries pyrite, galena and copper sulphides in considerable quantity.

The Big Betsy vein strikes east across the extreme northwest part of the property. It showed a reported width of 12 feet where cut in an adit 300 feet long. There is no record of ore milled from it.

The Indian Gulch vein is on the east side of the property. Ninety tons of ore from it is said to have plated \$10 a ton. It is about four feet wide and only slightly developed.

Water from the river and from Forbes Ravine might be utilized. Three miles of road would be needed to connect with a road from Enterprise.

Daisy Prospect comprises two claims in SE $\frac{1}{4}$ Sec. 4, T. 21 N., R. 6 E., one mile east of Mountain House at an elevation of 3750 feet. Howard Silsbee and O. G. Thomas, owners, are running an adit to cut a pocket shoot formerly mined in a shaft a little higher. The small veins and stringers of quartz occur at the surface in red and yellow ochre derived from black slate and mica schist, the entire mass of which appears to be out of place as the laminae strike east.

Another vein shows a width up to one foot where it has been trenched for 100 feet northwest. It shows some patches of coarse pyrite which

in this region distinguishes the ore veins from those of less value. A depth of only 10 feet has been reached on this vein and there has been no production.

Denver Mine. Charles L. Falk, owner, Woodleaf. Leased to E. LeG. Reeves of Clipper Mills and Gil Peyton. It is in the W $\frac{1}{2}$ of Sec. 4, T. 19 N., R. 6 E. The lessees are doing some work.

Evening Star Claim is in SE $\frac{1}{4}$ Sec. 8, T. 21 N., R. 5 E., presumably on the south extension of Pinkston vein, 9.5 miles from old Yankee Hill. Elevation 2680 feet (aneroid). John Wells, Yankee Hill, owner. The Western Pacific Railway is about one mile distant down the steep canyon, but with no road to it. The vein outcrop strikes N. 30° W.

An adit 120 feet long follows the vein on strike. The deposit is essentially an altered zone of amphibolite schist, mineralized with thickly disseminated pyrite, zincblende and copper sulphides, and leached by descending water near the surface, with some small crusts of azurite and malachite. At 50 feet in the adit, a width of six feet is said to carry \$4 to \$5 free gold. A winze sunk 12 feet in the adit floor 50 feet from the portal shows an 8-inch vein of heavy sulphide carrying from 6.62% to 13% copper, 1 to 5 oz. silver, 80 cents gold and some zinc. In the adit and crosscuts a width of 50 feet or more is leached and altered to a soft mass of clay and silica.

Water can be had one-half mile distant and 400 feet lower. There is no equipment.

Florence Prospect. Howard Silsbee, owner, Mountain House via Berry Creek. There are two claims, 40 acres, in Sec. 4, T. 21 N., R. 6 E., one-half mile north of Mountain House.

Three veins of quartz carrying coarse pyrite, strike north in a width of 130 feet. The Rose Quartz or westernmost vein is unprospected as it does not outcrop but was struck accidentally in a hole, where it is said to 'pan.' The Middle or West vein prospects where side stringers make into it. This vein is four feet wide and has been prospected by a shallow tunnel and a shaft 50 feet deep which cuts through it at 14 feet. It dips 80° west. The East vein, nine feet wide, is said to be traceable for one-half mile.

The owner has run a crosscut adit 162 feet to prospect the three veins. He estimates he has 25 feet to go to reach the Rose Quartz, 85 feet to the West and 155 feet to the East vein. Work will be continued during the present year.

Forbestown Consolidated Gold Mines. M. J. Cooney and F. G. Stoer, Forbestown, owners. This group includes the Gold Bank Mine of four quartz claims and a millsite in NW $\frac{1}{4}$ Sec. 11 and SW $\frac{1}{4}$ Sec. 2; Golden Queen, two quartz claims adjoining Gold Bank on west, on the same vein; Golden King claim, adjoining; all of section one and N $\frac{1}{2}$ of NW $\frac{1}{4}$ of Sec. 12; Oroville No. 1 and No. 2 placers; Shakespeare Mine (three quartz claims lying mostly in Yuba County), E $\frac{1}{2}$ of Sec. 10, and Miller Mine in Sec. 15 (Yuba County), all in T. 19 N., R. 6 E., and making a total of 1035 acres patented land with other unpatented claims, all near Forbestown.

Because of the past record of the Gold Bank and the possibilities of the different units of the property, it is probably the most interesting and important quartz mining group in the county.

The country rock has been mapped as amphibolite schist, a group name adopted to include a number of ancient igneous rocks which have been in the main altered by dynamic metamorphism. The rock forming the hanging wall of the Gold Bank vein is a hard, dense, fine-grained, dark-green diorite, and blocky rather than schistose. The footwall country rock is syenitic. A large granite batholith lies one mile north, and gabbro-diorite one mile south.

The *Gold Bank Mine* had been worked previous to 1887, and in 1888 a Huntington mill was in operation, but the principal activity was from 1888 to 1904. In 1890 four 5-foot Huntington mills were in use and the sulphides were being worked by chlorination after being roasted in a reverberatory furnace. Later, stamps were substituted for crushing but chlorination was used throughout the period of operation. Forty stamps were in service for ten years, when 20 more were added, and all 60 were run for six years longer.

The earlier operations were through adits and an inclined shaft on the vein. The Gold Bank and Golden Queen claims are on the south side of the canyon of South Fork of Feather River. The vein strikes about east and has an average dip of 35° north, so that the original operators could have greatly increased their net profits by taking advantage of the topography, driving a lower adit and putting the mill below the adit portal. This adit was finally driven but the mill was left above, requiring hoisting of ore. The adit, at an elevation of 1800 feet (altimeter) is 8 by 8 feet in cross section in hard diorite requiring no timber, running southwest and cutting the fissure 1275 feet from the portal. At this point, raising on the vein connected the bottom of the shaft with adit, the inclined depth being 1600 feet on dip at adit. From this connection the adit was continued to a total length of 2500 feet without cutting other veins of apparent importance. Nine levels in all were run between the shaft collar and drain adit, besides which five earlier adits had been driven on the east slope, so that the vein was stoped for an inclined depth of 1850 feet on dip. The third and seventh levels, about 1100 feet in length, were the farthest east, and third level was run 1200 feet west, making a total length of about 2300 feet explored on the strike but at only a shallow depth. The largest stope on the Gold Bank (on east side of shaft) was about 450 feet on the strike by 600 feet on the dip. The stoped width where the workings could be seen by the writer in the Gold Bank between levels eight and nine varied from 3 to 11 feet. The ore formed in lenses on both walls; in places both in the Gold Bank and Golden Queen, a lens may be seen on the hanging wall overlapping one on the footwall side of fissure, which may be as wide as 40 feet. The horses of rock between the lenses is apparently the only waste handled in stoping.

The shaft gave access to the *Golden Queen* on the west and this property was worked from 300 level to surface, largely under lease as separate owners had the two mines at the time. Here the stoping was on the hangingwall side and it is said the footwall lenses have not been mined. Where seen on the 300-foot level a footwall lens has a width up to eight feet. There is a possibility of opening up a large block of ore on this side of the mine by extending the levels below No. 3 westward into the *Golden Queen*. There are also possibilities of opening up more ore on the footwall on the *Gold Bank*, and the

possibility that the lower levels may not be exhausted. Practically no stoping was done on the Golden Queen below the 300-foot level, nor below the ninth level in the Gold Bank.

There is no full and authentic record of the production of either property. The total output of the Gold Bank is placed at \$2,000,000, of which \$500,000 was profit. The record of the Golden Queen when operated under lease by the Stow family, owners of the Gold Bank, from October, 1896, to October, 1898, showed 79,689 tons milled which yielded \$372,565, according to figures furnished by M. J. Cooney, or a net recovery of \$4.67 a ton, from which 25% royalty was paid, and a total profit of \$132,334 was realized (including royalty). It is said that part of the cost of advancing the lowest adit was also charged. It is reasonable to suppose that the Gold Bank ore was of somewhat similar grade; it was mined and milled for \$2.50 a ton (in 1893-1894) exclusive of chlorination of sulphides which cost \$7 a ton.

The ore is solid white quartz, with subordinate ribbon structure near the walls. The free gold content is said to be about \$1.50 a ton and the sulphides forming 2 to 7% of ore carry the balance, with silver, copper and it is claimed some telluride. The value of sulphide concentrate (principally pyrite with a little copper sulphide, in specimens seen) varied; in 1890 it was reported¹ to be 7% of ore and to carry \$85 gold and 9½ ounces silver per ton, and in 1894² it was 2% to 3% of ore, yielding \$40 per ton in silver and \$20 per ton in gold. Elsewhere it is said to be \$150 a ton. The sulphide is erratically distributed in bunches, so that hand sampling is apt to give spotty results. A little cement copper was saved. The percentage of recovery was said to have been low in early operations but later was claimed to be 92% to 95% of gold and up to 83% silver. The output of 40 stamps in 1896 was 4300 tons a month and 105 men were employed.

The last work done on the Gold Bank was in 1916, when A. I. Eagle produced about \$20,000, shipping concentrate to a smelter and cyaniding slimes.

M. J. Cooney has formulated a plan for opening and working the Shakespeare and later the Miller by extending the lowest adit in the Gold Bank southwestward where he expects the Shakespeare vein would be encountered and could be followed on its strike southwest, prospecting the Shakespeare and Miller groups of claims at a vertical depth of from 1000 to 1760 feet. This adit would also offer means of prospecting other veins in the vicinity.

The *Shakespeare Mine*, first worked in the eighties, was operated a short time about 1892 by Hobart and Lane who installed a 20-stamp mill and reduction plant. A shaft was sunk 230 feet and two levels were run. No. 2 level, the longer and deeper, was carried 350 feet north and about 600 feet south, the latter connecting with a pump incline sunk a short distance from the surface. From a stope carried up from No. 2 level north for a length of about 300 feet, it is stated that \$137,000 was produced, but original records of tonnage and value are not available. The ore occurred in a lens, but in the stope was mixed with low grade material, with a width of 40 feet between walls, and with quartz occurring in stringers. As a result, the recovery by amalgamation was about \$3 a ton and concentrate value \$35 a ton.

¹ Cal. State Min. Bur. R. X, p. 127.

² Cal. State Min. Bur. R. XII, p. 83.

The ore is reported to be 16 feet wide and of better grade than above, in a winze sunk 65 feet below No. 2 level, 250 feet north of the shaft. The shaft sump is also said to show six feet of quartz.

On the No. 2 level south the vein split after being followed 150 feet, and aside from the drift run to connect with the pump shaft little was done on that side, where the face has little depth, due to slope of the surface.

The ore in part resembled that of the Gold Bank, but in running No. 2 level north the ore began to show considerable galena, with high silver content.

The *Miller Mine* was prospected to a depth of 250 feet by a shaft sunk close to the junction of the Miller and supposed Shakespeare veins. From this shaft the Miller vein was drifted 250 feet and the Shakespeare 370 feet. The ore was reported as carrying about \$3 a ton, and apparently there was little production from the 20-stamp mill.

Section one has been prospected only to shallow depth by pocket hunters and 'snipers.' A quartz vein there is reported eight feet wide and carries copper sulphide and free gold as well as the usual pyrite. It is locally considered a good prospect.

The old buildings and equipment on the Gold Bank have been idle and neglected many years and would have to be largely replaced. The portal of the lowest adit is near the confluence of two ravines and the water from these and from the tunnel could be utilized below on the slope for milling.

Glory Hole Mine adjoins Bloomer Hill Mine. It was a pocket producer up to a few years ago but is idle now. Pockets were mined in a glory hole, and later by shaft and tunnel.

Gold Mountain Mine. J. B. O'Sullivan, Los Angeles, and E. L. Bacon, owners. Patrick Carton, lessee, Inskip. Comprises two quartz and six placer claims covering entire NW $\frac{1}{4}$ Sec. 28, T. 25 N., R. 4 E., one-half mile northeast of Inskip.

The quartz claims were worked by a company and some production made with a 10-stamp mill 15 years ago. At that time an adit was run 720 feet. Carton began work in the spring of 1928. Four men were employed June 12, when an incline being sunk on a vein 3 to 8 inches wide was down 35 feet. About 150 feet east a shaft was sunk 45 feet, and on the dump here is perhaps 20 tons of quartz stained black and from a vein about one foot wide. The walls are a complex of rotten slaty schist, dikes and soapstone. A large vein runs northeast and if the small one continues to it, pockets may occur at the junction.

Carton was installing a 10-stamp Straub mill in June, to crush the quartz and stringers in the wall rock which occasionally carry pockets.

I. X. L. Quartz Prospect is in NW $\frac{1}{4}$ Sec. 20, T. 22 N., R. 4 E., on east side of the West Branch of Feather River. Elevation 1500 feet.

A vein 18 inches to 4 feet wide has been prospected in adits 120 feet and 250 feet long, 60 feet apart vertically, and in a shaft 80 feet deep, but higher on the slope. Thirty tons of selected ore is reported to have plated \$14 a ton, but a later general sampling returned only \$4.11 a ton, according to Sidney Wellington. A vertical range of 150 feet was prospected, and a length of several hundred feet, by the workings.

Lewis Mine comprises three claims in Secs. 2 and 11, T. 19 N., R. 6 E., containing 60 acres, one mile by road east of Forbestown. Harriet Lewis, owner. Elliott Check, Warren Brayton and associates have been prospecting the claims for about a year.

Development work consists of a series of tunnels and raises connecting with the surface, and a few small stopes. The lowest and principal tunnel is one 1038 feet long running about S. 20° W. at a depth of 395 feet below the surface on the dip at the face. This followed a vein generally 15 inches to 18 inches wide in lenticular form. A small stope near the portal yielded ore which is stated by Check to have plated \$8 a ton in former operations. Near the face a raise of 220 feet on vein, and a small stope, connect with an upper crosscut level 400 feet long, near the face of which some small stopes were opened, and connections made with the surface. The distribution of ore is said to be spotted, in an ore zone pitching north. The recent work has not developed enough ore, according to Check, to offer much encouragement. Stopes are about 40 by 30 feet, and up to two feet in thickness of ore was mined.

There is a mill of five small stamps, a rockbreaker and one concentrator. Water power was used formerly, but recently an automobile engine has been substituted for it at a great reduction in cost, as water rates are high. Four men were employed in July.

Mathewson Mine, now a part of the Springer Consolidated (which see) is on a so-called dike, which in reality is a series of formations corresponding in all respects to the Calaveras (Carboniferous) and associated rocks of the Mother Lode counties, of which it is a continuation on the strike northwest.

The hangingwall of the series is of serpentine, and going across in section to the footwall, the rocks are: Solid 'bull' quartz vein, two feet wide; rusty red-brown decomposed dike rock, with quartz stringers; rotten schist; Calaveras slates, schists, siliceous rocks, 200-300 feet wide. While the entire series is said to carry a little gold, the best pay is reported where stringers from the Calaveras formation intersected cross-faults. Mathewson ran a hydraulic cut for 800 feet along the strike on the hangingwall side, and another cut was made on the footwall side, indicating a total width 600 feet. A \$1,500,000 production was claimed. He also operated an 8-stamp mill for a time on a quartz vein exposed by the placer mining.

McClung Prospect comprises two claims on a quartz vein reported to be 4 to 30 feet wide and traceable a long way, on Wild Yankee Creek, a mile south of east of Berry Creek station. C. J. Willett, Harts Mills, ran two adits here 25 years ago. One was 200 feet long on the vein, which assayed \$1.50 to \$12. This is caved now. The other was a crosscut 110 feet long crossing through the vein, which is said to have a high sulphide content. J. McClung, Harts Mills, has lately relocated the claims.

McHugh Prospect is in SE₁ of SW₁ of Sec. 36, T. 24 N., R. 3 E., adjoining the old Toadtown Mine. P. J. McHugh, Dave Campbell, A. L. Donnelly and others have sunk a prospect shaft which was 18 feet deep on July 22, and was on a vein said to prospect well. There is a small pump run by a gasoline engine to keep the shaft unwatered.

Pinkston Mine is one claim in NE $\frac{1}{4}$ Sec. 8, T. 21 N., R. 5 E., 9.2 miles by road from old Yankee Hill. R. L. Bohannan, owner, Yankee Hill. Elevation 2500-3000 feet.

Pinkston first worked the property about 1890-1895 through an adit 100 feet long about 50 feet below the outerop. The red oxidized ore was stoped 12 feet wide and 60 feet long, and is reported to have plated \$8 to \$9 a ton, and to have produced \$16,000 with a mill of five small stamps. Work ended when sulphide ore came in. An unusual feature was the occurrence of barytes as a gangue mineral. It is too impure to be of commercial value, however, where seen in the old working.

A new adit has been run perhaps 100 feet lower, in a southerly direction for 110 feet. The formation is amphibolite schist, with schistosity striking N. 30° W. at the face. There a width of 20 feet or more revealed by the diagonal course of the adit, is impregnated with pyrite and small amounts of copper sulphides and zincblende. A number of assays indicated \$2.50 to \$3 a ton gold, according to John Wells.

Porter Mine is in Secs. 17 and 20, T. 22 N., R. 4 E., 7 miles north of Yankee Hill via Jordan Hill road. Sidney Wellington, owner, 321 Montgomery Street, Oroville. Elevation 1740-1900 feet.

It was first worked in the early fifties. A vein of solid quartz, in part brecciated and re cemented by brownish silica, is six feet wide and strikes north, dipping 75° east. A large part of it has been worked to a depth of 10 feet for a length of 300 feet and the quartz crushed in arrastres. Porter made some production also previous to 1870. Later an English company and then W. T. Coleman prospected the vein, but there is no record of production by them. An incline shaft is at least over 140 feet deep on the vein besides which several adits were run, one 140 feet below the outerop. There is no equipment.

Rainbow Mine. Millen Griffith Estate, owner, San Francisco. In SW $\frac{1}{4}$ Sec. 29, T. 22 N., R. 4 E., six miles northwest of Yankee Hill on Jordan Hill road.

This mine was discovered on railroad land in 1889 by Wellington who lost it in a lawsuit after producing \$9,000. It was later worked until December, 1893, and produced probably \$40,000 according to Wellington. A 5-stamp steam power mill was used.

An inclined shaft was sunk 350 feet on a quartz vein averaging two feet wide, and ore was stoped from three levels from 250 feet deep to the surface. The ore was of good grade, averaging \$25 a ton, and being very rich in places, above the 250-foot level, but poor in the bottom of shaft. The vein strikes northeast and is crossed by a dike at the mill-site. The old 5-stamp mill lies on the ground.

Silver Moon Group (formerly *Porphyry Point*) is in S $\frac{1}{2}$ of NW $\frac{1}{4}$ of Sec. 18, T. 23 N., R. 4 E., and contains about 32 acres. H. Bartram, Coutolene, owner. Property is on a good road and one-fourth mile from railroad. It covers a dike deposit and a quartz lode in decomposed dolomitic talc-schist. In the latter, quartz veins occur on both walls of a light gray dike two feet wide with pyrite in coarse cubes. It strikes north and dips east. The quartz is eight inches wide on the hangingwall and 3 $\frac{1}{2}$ feet wide on the footwall. It carries pyrite in patches, and small amounts of chalcopyrite, but only a few shallow cuts have been

made on it. It is probably low grade. A similar deposit, perhaps the same vein, occurs at the old Perschbaker workings.

The dike deposit is of interest geologically and for its mining possibilities. It is so thoroughly decomposed that it is of sandy nature, colored red and yellow, and with seams of quartz up to an inch wide, stained by manganese and carrying gold. Lenses and bunches of rotten dolomitic schist stained by mariposite and thickly pitted with iron oxide derived from pyrite, probably are residual fragments of the original rock from which the deposit came. There are some patches of partly altered slate also. Serpentine runs parallel on the footwall side. The dike strikes northwest and the exposed lens-shaped body, mostly included in this claim, is 1800 feet long by about 800 feet wide. To the southeast it is covered by a run of lava cobbles, supposedly underlain by a gravel channel.

Some of the deposit has been worked by ground-sluicing in years past and Bartram has mined a little of it with a drag-line scraper. This outfit, operated by a 15-hp. gasoline engine, has a three-fourths cubic yard bucket and can handle 150 cubic yards in eight hours under favorable conditions. On account of the loss of gold in the coarse quartz which goes out of the sluice in the course of ordinary washing, he plans to install a screen to save the quartz and an arrastre or small mill to crush it. The deposit is susceptible of very cheap operation by the method planned and should yield a profit so long as that method can be followed.

Southern Cross Mine is in SE $\frac{1}{4}$ Sec. 32, T. 20 N., R. 6 E., about four miles northeast of Enterprise by road and trail, adjacent to South Fork of Feather River. Owner, Edel Mines Company, I. L. Rosenthal, president, 177 Post Street, San Francisco.

The lower adit, about 1800 feet long, enters from the east bank of the river on the southwest end of the Southern Cross claim and runs on the vein through that claim and the Manzanita fractional claim into the Manzanita Extension. The vein strikes southwest and dips northwest in granodiorite. Three small stopes of ore have been mined; one near the portal and one midway in the adit have been carried to the surface, and another near the face has been worked to a height of about 100 feet. Two winzes, each about 75 feet deep, have been sunk below the main adit in the latter two orebodies, the first showing the vein seven feet wide and the second, four feet wide. From the inner winze, lower drifts have been run 105 feet and 95 feet, respectively. Apparently only parts of the orebodies have been stoped above the lower adit. Ore is said to have averaged \$8 a ton, with some bunches of higher grade, and high grade concentrate. An upper adit 700 feet long is connected with the lower.

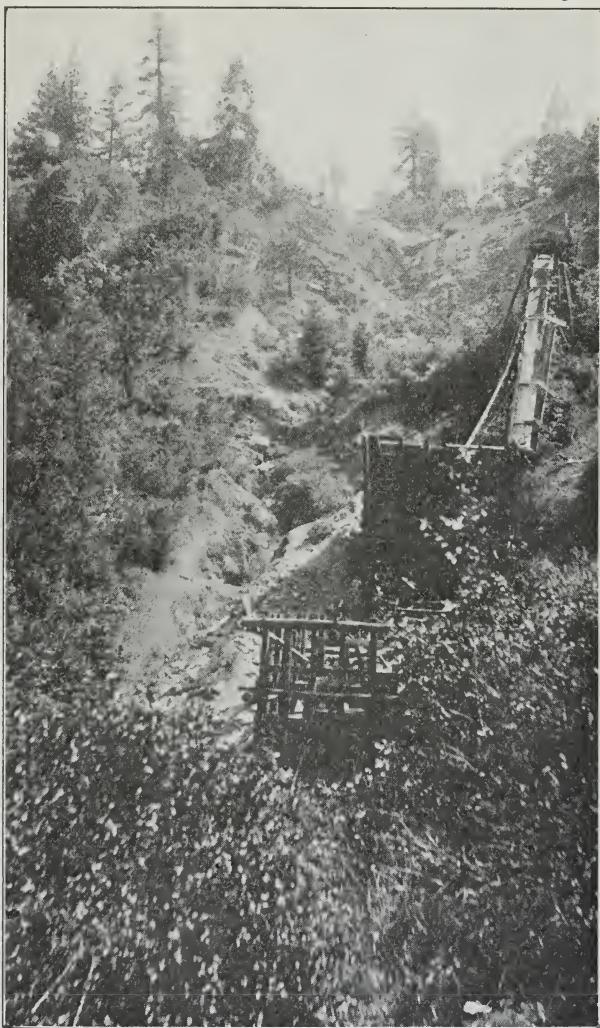
On the opposite side of the river on same level as the lower adit, an adit runs southwest 400 feet, with a winze 50 feet deep about midway of it, and 30 feet of drifting from the bottom of winze is claimed to be in ore three feet wide.

There is an old mill of four stamps, a ball mill, and old concentrator on the property.

Springer Consolidated Mine. Owner, Springer Consolidated Mining Company, Box CC, Tonopah, Nevada. This comprises the Springer Mine, Mathewson Mine and a mill site, in all about 45 acres in E $\frac{1}{2}$

Sec. 34, T. 24 N., R. 3 E., 6.8 miles by good road from Magalia, the nearest railroad station. Other unpatented claims were formerly held.

The Springer and Mathewson claims, respectively, were worked by ground sluicing and hydraulicking for many years by their then owners, Springer and Mathewson. The Mathewson claim yielded a large sum. It is separately described herein. The Springer, worked



Springer Consolidated property near De Sabla, showing formations that were mined by steam shovel.

on a smaller scale, paid a living to its owner, and undetermined amounts to wandering pocket hunters who worked small seams known to carry coarse crystallized gold. The deposit (described under Mathewson), is a belt striking northwest and dipping northeast, composed of serpentine, Calaveras (Carboniferous) schist and slate and associated altered and mineralized rocks, all carrying gold in small quantity but with

the best pay where seams and stringers in the Calaveras rocks encounter cross faults.

The company in 1915-1917 installed a plant for large-scale operation, spending over \$100,000. An open cut was started on the Springer. This is about 300 by 150 by 90 feet. Rock was churn-drilled and blasted and moved with a steam shovel into chutes delivering to bins. Five ball mills were used for grinding ore and Deister tables for concentrating after amalgamating. It is said a capacity of about 700 tons a day was reached and that work continued over a period of five months. Operations were terminated through the action of the Fish and Game Commission of California and the federal government, who objected to the dumping of tailing into Butte Creek. The property has lain idle since the early part of 1917. When the company started work, they stated the average value per ton milled was expected to be about \$1, with a cost of fifty cents a ton for mining and milling. The yield per ton came very close to the estimate, according to John G. Kirchen, general manager, and he believes the project would have been a success had it been allowed to continue.

St. Francis Mine. P. J. Hurley, Planters Hotel, San Francisco, owner. Claims in Secs. 28, 29 and 32, T. 20 N., R. 6 E., north of Feather River and three miles northeast of Enterprise. It was reported in June that workings which were left in 1924, after a fire, were to be reopened and sampled with the idea of forming a stock company.

Surcease Mine is in the N $\frac{1}{2}$ of Sec. 7 and adjoining parts of Secs. 5 and 6, T. 21 N., R. 5 E., 7 miles by road from old Yankee Hill. Berry Creek and Las Plumas on the Western Pacific Railway are each about 2 miles distant in the steep canyon but there is no road connection.

The mine was found on patented railroad land in Sec. 7 by M. P. Kinkaid and was purchased and operated by him and a partner in 1914-1916. In shallow workings near the surface, he is reported to have produced \$17,000 from ore that yielded \$7 a ton in free gold, with nearly as much in the sulphides. A 1-stamp mill and a Chilean mill were used. The holdings were taken over later by Goldfield Consolidated Mines and Exploration Company and other adjoining land acquired. After prospecting the mine, bottoming the ore and blocking it out, they decided it was too small for the scale of operations desired. The Gruss Mining Company later took a lease and option on it, but were unable to successfully operate it. After a period of idleness, Marc Latham and Gobel leased the mine on royalty and operated it at a profit from 1924 to 1927. J. W. Reno and associates later made some production and George P. Brennan and others were preparing to mine more ore in June, 1928. The total production has been over \$200,000 to date. The larger part of ore mined averaged \$9 a ton; some was much better, yielding \$12 a ton or more.

The country rock is amphibolite schist but a granitic batholith is exposed only two miles southeast. The vein strikes northwest, with the principal ore shoot pitching N. 18° E., being bounded by a fault. The north ore shoot which yielded most of the gold, extended from near the surface to the 210-foot adit level where it appeared to be definitely bottomed as a lower sub-level run by Latham, failed to strike it. This ore shoot was 132 feet in average stope length and 6 feet in average thickness though at times much wider. The vein in the shoot was of

solid quartz with subordinate ribbon structure and variable but rather high content of coarse pyrite in patches, carrying a small amount of copper sulphides. Latham reported nearly all the gold was in the sulphides, and quartz with little or no sulphide was low-grade. The south ore shoot aped about the 210-foot adit level, had a pitch length of about 140 feet and a stope length averaging 110 feet. It also has been bottomed, to judge by results of work below it.

The shaft, 610 feet deep, is on an incline of 24° to a depth of 450 feet, there steepening to 40° the rest of the way. It passed diagonally across the fault block containing the two ore shoots. The principal working level was the 210-foot adit, entering from Shields Gulch near the mill and running northwest on the vein 1000 feet or more, crossing the shaft and extending to the north fault. A level above it was run 420 feet southeast and 560 feet northwest and beyond north fault. Below the adit, a level was run both ways and raises put up to prospect for the downward extensions of both ore shoots which did not materialize. The 600-foot level was also run 450 feet southeast and 600 feet northwest giving some good assays but not finding any orebody.

Latham found the ore well adapted to cyanidation. It was ground to minus 30 mesh in a 4-foot by 3-foot ball mill and all cyanided. His operating cost for mining, milling, treatment and marketing bullion was \$5.03 a ton. The plant had a capacity of 45 tons in 24 hours, and about 27,000 tons were treated.

Since Latham quit work here, the plant has been changed, first to combined concentrating and cyaniding and now to concentrating, it being planned to ship out concentrates. Equipment in May, 1928, included two 4-foot by 3-foot Hendy ball mills, one Overstrom concentrator, Dorr classifier and 7-inch by 9-inch crusher. An air compressor was to be installed. Electric power is used. A few thousand tons of ore remain in sight to be worked.

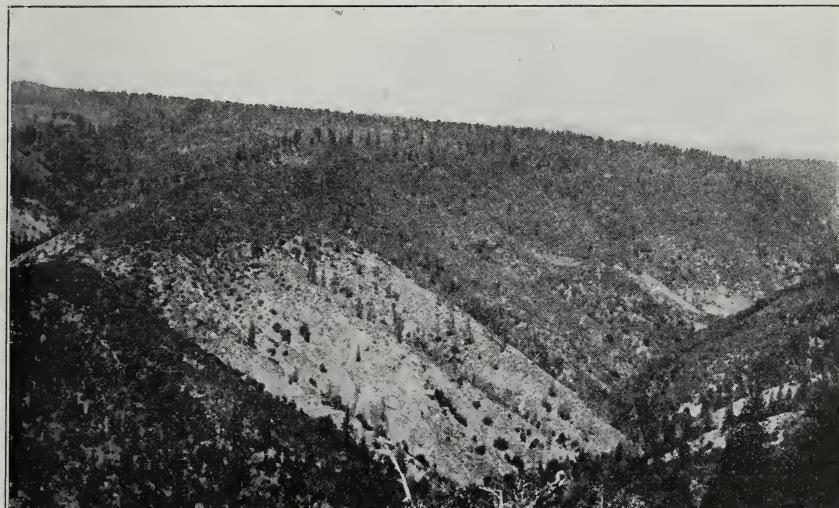
Triumph Mine. Owner, Triumph Gold Mining Corporation, 403 Van Nuys Building, Los Angeles. Five claims, containing about 90 acres, are in S $\frac{1}{2}$ Sec. 15 and N $\frac{1}{2}$ Sec. 22, T. 20 N., R. 7 E., three miles southeast of Lumpkin.

Heretofore, a blanket vein has been worked, which yielded free gold without sulphides on account of the nearness to surface. The mine is on the north side of canyon of South Fork of Feather River, and is opened by adits. No. 3 adit, 900 feet vertically above the river, is connected with No. 2 adit, over 100 feet higher, by a raise which strikes No. 2 about 200 feet from the portal. The property was not visited. It is reported that the vein was found in an intermediate level between No. 2 and No. 3 adits during the past year, having apparently straightened up to a dip of 70° between definite walls. It is at a contact of granodiorite and 'diorite' where a branch of a granitic batholith intrudes amphibolite. The vein is from 18 inches up in width.

The prospects developed led to the erection of a new mill of five 1250-pound stamps, which was completed in January, 1928. This has 100 square feet of outside amalgamating plates but no concentrator. A free water supply is taken by two miles of ditch from Knownothing Creek and Devils Ravine. The stamps and rock breaker are operated by separate water power wheels. A few men are employed.

GOLD (PLACER MINES)

From the earliest days of gold mining in the state, Butte County has been known as a producer of placer gold. The drift mines which were opened after the exhaustion of the surface placers have proved to be mostly on small channels but a few of them, notably the Emma, Indian Springs and Perschbaker, were rich producers over a long period of years. In the main, however, these mines give employment to only a few men each, and there is such a large number of them in the county that are or have lately been active that a much longer period than expected had to be spent in the field in order to bring the division's records to date. The principal drift mining section is bounded on the east by the West Branch of Feather River, on the west by Big Chico Creek, and extends from the vicinity of Centerville and Paradise on the south, in a direction a little east of north to the top of the mountain divide in the northeast corner of the county, where the waters of the



Cañon of Little Butte Creek, Butte County, from Lucky John Mine. The inlets and outlets of several paying drift mines were found in this trench.

West Branch are separated from those of the North Fork of Feather River by summits about 6600 feet high. The streams in this section flow south and southwest, cutting the lava-covered slope into a series of long ridges beneath which are found a multitude of steep, narrow gold-bearing ancient stream channels. None of these so far exploited compare in size or characteristics with the large ancient rivers of the counties farther northeast and southeast, although larger channels have been mined farther southeast in Butte County at Bangor and Cherokee.

The Ione shore line extends northwest, bounding the drift mining district at Cherokee and Mineral Slide (near Paradise). From the points where the ancient streams emptied their loads into this old ocean, and where the erosive action of waves and modern streams resulted in concentration of gold under favorable conditions, southward

to Thermalito and Haselbusch, south of Oroville, there existed until about ten years ago some of the richest gold dredging fields ever found. The total area of profitably dredgeable ground in the Oroville district was about 6500 acres, taking in part of Oroville townsite and extending southward along Feather River about seven miles with an average width over one mile. Besides this, there were smaller areas, as at Wymans Ravine, Honcut Creek and on Butte Creek, the latter near Chico. The dredging industry in the county reached its zenith between 1900 and 1910. In 1902 there were 35 dredges being operated by 12 companies and in 1908, there were 34 dredgers, which produced over \$3,000,000, each of these years, and during the period the county was more than once the leading gold producer of the state. As shown by the analysis of placer gold production from the county (see, post) the dredger output rapidly decreased from 1916 onward. At present there is no active dredger in the county, although Lawrence Gardella is preparing to put a small boat in operation near Haselbusch. The gold dredging operations have been described at length in our past publications.¹

Hydraulic mining, once carried on at Cherokee on a large scale, and at a few smaller mines, practically ceased in 1915 as far as recorded production is concerned. There appear to be no new data to add in this regard. Many so-called dike deposits exist which have been found to carry enough gold in the superficial oxidized and weathered zone to repay hydraulicking and ground sluicing. Numbers of these have been worked in years past. They are, properly speaking, lode mines and some are described under that head herein, but the production from many of them appears in the tabulation under 'surface' mines.

The following tabulated analysis of placer gold production from Butte County for a number of years gives an idea of the relative importance of the different branches:

Partial Analysis of Placer Gold Production, Butte County²

Year	Dredges	Drift Mines	Hydraulic	Surface
	No. Amount	No. Amount	No. Amount	No. Amount
1906	15 \$2,768,782	12 \$102,908	5 \$37,220	24 \$101,207
1907	35 2,697,092	9 22,158	3 18,375	22 48,103
1908	34 3,043,151	11 13,878	1 12,736	25 56,192
1909	2,890,273			
1910	32 2,389,235	14 47,497	5 15,775	16 15,998
1911	30 2,251,764	12 22,937	4 9,152	28 27,769
1912	28 2,271,996	19 31,545	3 7,205	18 14,182
1913	25 2,122,926	12 43,894	3 4,871	14 62,092
1914	21 1,637,515	43,732	5,034	6,678
1915	17 1,491,006	5 13,746	2 5,644	8 30,910
1916	14 1,210,874	5 12,004		6 15,369
1917	11 893,141	13,984		10,490
1918	8 626,010	6 4,394		7 11,765
1919	6 361,604	4 7,130		7 6,642
1920	4 441,650	4 19,462		7 3,414
1921	4 420,017	1 3,328		8 28,805
1922	4 452,191	6 34,406		5 4,915
1923	4 398,125	8 73,727		11 19,660
1924	4	4 7,092		
1925				
1926	Total Placer Production 33 operators, \$228,031			
1927	Total Placer Production 32 operators, \$143,294			

Many placer mines in the northeastern part of the county, which are now idle, have been described in U. S. Geological Survey Professional Paper 73, pages 95 to 98. Several of these have been worked out, and

¹ Cal. State Min. Bur. R. XV; Bull. 57; Bull. 85.

² Abstracted from Mineral Resources of U. S., U. S. Geol. Survey.

there has not been much work done in that section in recent years, so that a full new investigation appeared unnecessary, although a number on which work is being done are mentioned herein.

Very little work has been done in late years at Bangor, where drift mines were formerly worked through shafts.

A few small placer mines, mostly surface sluicing, are worked in winter near Clipper Mills, Hurleton and other sections in the eastern part of the county. Time was not available for visiting these.

Bader Brothers (formerly Mat Bader) Mine contains 160 acres in Sec. 36, T. 23 N., R. 3 E., on the east side of Little Butte Creek, one-half mile from Magalia. E. F. Woodworth, lessee, Paradise, has been prospecting the claims since November 15, 1921. The production so far has been only nominal, no regular breasting having been carried on by the present operator, but some was done previously.

The main adit runs S. 60° E. for 500 feet and the remaining 800 to 850 feet to the face (July, 1928) has a winding but generally southeast course, running from S 25° E. to S 48° E. at the face. A channel has been encountered but not bottomed. It is evidently the same run of gravel opened in the Pitts Mine, downstream. The main adit has crossed this channel diagonally in a length of 100 feet near the face, having been run from the west rim to the east rim, which was being followed late in July. Good prospects were reported on the east rim. A branch drift running S. 65° E. and 153 feet long, shows rotten porphyry boulders covered by one to two feet of granite sand, and this in turn is covered by lava sand filled with small rotten granite boulders. In holes sunk six feet below this drift near the face, bedrock and good pay gravel are reported. A pump is needed to keep out water and permit further work downstream in this direction. The elevation at the portal is 1970 feet.

At a point 900 feet from the portal a drift runs due east 50 feet and southeast 50 feet, where there is a raise 10 feet and an upper level running 150 feet southeast. Here a raise was put up 20 feet on the steep bedrock of the east rim showing large boulders and a good prospect high on the rim.

Three to five men are employed. A blower for ventilation is run by water power. Hand tools are used, but electric power is available one-fourth mile distant. Water from the workings is stored in a small reservoir for washing gravel.

Black Diamond Drift Mine is in E $\frac{1}{2}$ of Sec. 34, T. 24 N., R. 3 E., and contains 31.4 acres adjoining the Springer Consolidated Mine. The owners are E. N. Understock, Route A, Oroville, F. and R. Duensing and L. Mecum, Chico. Magalia, on the railroad, is 6.8 miles distant by good road.

This claim was included in holdings on which the Indian Springs Channel Gold Mining Company sank their Kirby shaft 186 feet in 1917, and did some other work without results. A gravel channel traverses the Black Diamond property and the upstream section of it is faulted downward a reported distance of 225 feet by a fault which strikes northwest along the course of the Springer and Mathewson dike. The segment of channel southwest of the dike was profitably worked, and the stub of the old adit may be seen in the old open cut

of the Mathewson Mine, which cuts across the lava-covered channel. The channel courses S. 18° W., and is reported 80 feet wide on bedrock. The lava fill at the surface is about 250 feet wide. The trough is filled with andesite mud and boulders. An upper sand run is underlain by a bench of pay gravel, with the main channel 18 feet lower.

In 1924, an inclined shaft was started by the owners just northeast of the fault and was sunk 280 feet on 40° incline. This apparently struck the southerly rim or a bench as the other rim has not yet been found. A crosscut was run 75 feet west in gravel reported to carry \$2 to \$3 a cubic yard in the part near bedrock. The gravel is tight, requiring drilling and blasting. No work is being done now. The claim is well equipped, having a 40-h.p. boiler, two compressors, hoist, three pumps, air fan, air drill outfit, shop and several buildings. Electric power is two miles distant.

A tunnel 800 feet long, partly on other property, would reach a point about 50 feet vertically below the shaft sump, and if water were taken down the Kirby shaft a cheap method of underground sluicing could be used.

Blue Hog Mine. Owner, Feather River Land and Mining Company, c/o D. Joseph Coyne, 407-408 Security Building, 510 South Spring Street, Los Angeles. It was last worked in 1920 under lease by Henry S. Porter with E. F. Woodworth, Paradise, in charge. This work was terminated by a lawsuit concerning the water supply needed to wash gravel.

This old mine had been worked at intervals for nearly 40 years. It covers about three-fourths of a mile of a lava capped channel containing loose gravel on slate bedrock. The pay gravel is two to five feet deep and 70 to 100 feet wide. There is a main tunnel which was reported to be 1700 feet long early in 1920 and a drain tunnel 900 feet long. Over 1000 feet of main tunnel is said to have been driven by the last operators and they mined a width of 100 feet for a distance of 400 feet upstream. The lower end of the ground is said to be rich, but a section of channel 2000 feet long is too low to be worked through the present tunnel.

The mine is supposed to have a normal supply of 800 inches of water, but this water right is in conflict with the Paradise Irrigation District. When sufficient water was available, mining was done by piping water to the breast and washing the gravel in sluices laid in the tunnel. The property is equipped with a compressor, 4200 feet of 10-inch to 2-inch pipe and 1700 feet of 14-inch by 16-inch sluice boxes.

Cherokee (Spring Valley) Placer Mine has been frequently described in past reports of the State Mining Bureau. It comprised about 1500 acres around the old camp of Cherokee. About 150 acres was hydraulicked to bedrock, with a bank 500 feet high and nearly as much was worked to within 15 feet of bedrock, the lower portion being cemented. The bottom of the channel is flat, and about 700 feet wide. Lindgren believed it was the bed of a broad, steep gulch. For many years this was one of the largest placer gold producers of the state. It had a ditch system 94 miles long, supplying 2200 miners' inches of water. During its long period of inactivity, the water rights and

ditches have been lost and abandoned, so that at present there is only about 200 inches of water believed available. For a full description of the property, the reader should consult the reports cited below. The mine was worked by hydraulicking exclusively from 1858 to October, 1890, having been previously mined in small parcels by many separate owners. The production previous to 1870 was estimated at over \$5,000,000. From 1870 to July, 1886, it produced \$5,008,208.62.

Bibl: Cal. State Min. Bur. R. VI, part 2, pp. 24, 25; X, p. 124; XI, p. 155; XIII, pp. 92, 93; XVIII, pp. 258, 259. U. S. Geol. Survey, Prof. Paper 73, pp. 86, 87.

Cory and Strong Placer Mine is 2.8 miles by road north of Stirling City, containing 320 acres in E $\frac{1}{2}$ of Sec. 16, T. 24 N., R. 4 E., on the west side of West Branch of Feather River. Cory and Strong, owners; E. L. Williams, W. H. Weimer, and Wilbur H. Mallman, lessees, Stirling City.

A large, lava-covered trough, with rims 1500 to 2000 feet apart, crosses the property. In its bottom is supposed to lie an auriferous channel locally called the Mammoth Channel. Going upstream on the West Branch about three-fourths mile from the present shaft and a little north of the property, the stream enters hard diorite or gabbro-diorite and the rim of the channel turns east; the river from here up is said to flow on such bedrock for eight miles, and here it has cut a canyon 50 feet deep in it. Going south on the road toward Stirling City, the southeast rim of rotten granitic rock and the lava fill are plainly seen in the cut just west of the road, 1.7 miles south of the shaft.

Years ago, Cory drove an adit 700 feet long about 400 feet south of the property line at an elevation of 3300 feet (aneroid). It is said to be on a secondary flow. The lessees are sinking a vertical shaft about midway of the property, and about 75 feet above the river on the west side. This was 53 feet deep when visited in June, 1928, and was being equipped with two small gasoline engines, a 6-inch pump and hoist. The depth necessary to sink to reach the channel trough is uncertain, but it seems likely that it will be considerably farther than estimated by the operators, although benches above the trough may be encountered on the way.

Dix Drift Mine is west of Big Butte Creek in Sec. 22, T. 24 N., R. 3 E., about 9 miles by road from Forest Ranch. It has been prospected during the past 7 years by a partnership, with Harry Sheehy, De Sabla, in charge. Many years ago the upstream part of the property was profitably worked.

Little West Branch of Big Butte Creek cut the Dix channel in two. The upstream part was worked for a distance of about a mile by the old Portuguese Point hydraulic and drift workings. At the upper end of this work a fault is said to have been encountered which dropped the upstream segment of channel 90 feet, and the Robison prospect lies on this segment. From the crossing of Little West Branch, the Dix channel was followed downstream 3000 feet in the old Dix Mine. Two runs of gravel, with separate rims in places, are reported there. The older channel, capped with rhyolite, is locally stated to have yielded \$7 a cubic yard for a width of 30 to 60 feet. A later channel

was 'spotty.' This work also encountered a fault, believed to be the same mentioned under the Black Diamond Mine herein, where the upstream segment of channel was dropped (or downstream segment raised) 225 feet. The work was stopped there, and the operations of the present partnership have been directed to finding and working the downstream section.

The mine was temporarily idle when visited and the underground workings were not examined. The following data were furnished by Harry Sheehy:

Sheehy and associates have driven a main adit 2350 feet west (elevation at portal 2040 feet) through slate and serpentine bedrock. This struck faulted ground 1900 feet in and was continued 400 feet across a 'dike' which Sheehy identifies as the same as the one described herein under Springer Consolidated Mine. The fault is said to be on the west wall of the 'dike' at a slate-serpentine contact. Near the face a vertical raise was put up 285 feet. An upper level was turned at a point 100 feet above main adit and was run 900 feet N. 30° W., when a raise was put up and struck gravel on the east rim of channel. The upper level was then continued 400 feet farther and position of both channels was determined by several raises. The older rhyolite-capped channel, carrying boulders of granite, slate, serpentine and schist, was found intact 15 feet above the later channel, which is capped by andesite. Crosscutting showed the early channel to be 250 feet wide, and the later 200 feet wide, with a bar or bench of the later channel between. About 300 feet of channel was worked downstream from the fault with disappointing results apparently due to the spreading out of the channels and flat grade.

Work has been carried downstream about as far as can be done from the upper level, and the present plan is to advance the lower adit in the direction of the upper face and then raise again into the channel. A 2-drill compressor is operated by a Pelton water wheel, using free water under 128 feet fall, brought by ditch and pipe from Little West Branch of Butte Creek. The water supply is said to be too small for a few months in summer to permit work. There are some small dwellings on the claims.

Emma (or Nimshew) Drift Mine is in Secs. 14, 15 and 23, T. 23 N., R. 3 E., between Middle Butte and Big Butte Creeks. It has been one of the best producers of the county, with a total output of \$1,000,000 or more. It was operated and is still owned by Nimshew Gold Mining Company, c/o John Erickson, 141 Sutter Street, San Francisco. George Allen has a lease and A. Rugh and R. Phillips are prospecting it. There are 590 acres in the property.

The Emma Channel, running southwest, was worked upstream for 5000 feet, and a branch called the Bootjack, which runs east, was followed 2000 feet. In the first adit a fault with a downthrow of 16 feet on the upstream side was struck 1600 feet from the portal. A new adit was run from which 3400 feet more of the channel was mined. A width of from 12 to 125 feet, but averaging not over 30 feet, was worked. The bedrock is soft, black slate, across which the channel ran at nearly right angles to the cleavage, making an ideal natural riffle, on and within the crevices of which all the pay was found. The grade was variable, being 10% in one section 1200 feet long, where no gravel lodged, and the lava rested directly on bedrock. Here six

feet of bedrock was mined as it was easier worked than the lava which made a good roof and still stands without timbers. There was much coarse gold. Where the grade flattened, there was a thickness of 4 to 5 feet of gravel. There was enough grade to permit sluicing the entire distance underground, water coming from a reservoir alone.

This channel and its branch were worked upstream at a profit until cut off by a later trough filled with barren lava cobbles and sand. One week's cleanup just before this, yielded $13\frac{1}{4}$ pounds of gold. Since then, during the past 15 years, close to 5000 feet of prospecting drifts and crossecuts have been run in search of the upstream section of the Emma channel, but all efforts so far have failed. This work is being done now through a crossecut which strikes the crossing of the pay and barren channels about 700 feet underground and at an elevation of 2145 feet (aneroid). This is about one mile north of the old portal.

Ethel Mine. Owner, Pacific Investment Company. An adit about 2700 feet long, with an incline of 80 feet 2550 feet from the portal and one of 400 feet near the face, failed to bottom the channel. A raise was made to the adjoining Index, where a bar was worked. This ground lies between Middle and Big Butte Creeks, one-half mile southwest of where the Mammoth shaft was started in search of the Mammoth channel, two miles west of Magalia. In June, 1928, new work was started at the Ethel from the west side.

Fouch Drift Prospect. Owners, F. Fouch, Chico, c/o J. A. Garland, Butte Meadows Stage; J. Fouch and W. M. Triplett. There are 160 acres in the claim.

This prospect is on the west side of ridge between Big Butte Creek and Chico Creek, in the Chico Creek drainage basin a few miles north of Forest Ranch. A rhyolite-capped channel has been prospected by adits started from a creek which crosses the channel. Going upstream, smooth, hard bedrock so far found has been reported unfavorable for a concentration of gold, though some pay has been taken out at intervals. The adits in both directions are short. There is thought to be over one-fourth mile of channel in the upstream section on the property and 500 feet downstream.

Genii Mining Company. Office, Room 549 Holbrook Building, San Francisco. The property consists of 485 acres of unprospected placer claims in S $\frac{1}{2}$ Sec. 19, N $\frac{1}{2}$ Sec. 30, T. 23 N., R. 4 E., and E $\frac{1}{2}$ of NE $\frac{1}{4}$ Sec. 25, T. 23 N., R. 3 E., from one-half to 1 $\frac{1}{2}$ miles north of Magalia.

The operators believe that an ancient channel, locally called the Mammoth and sometimes the Magalia channel, traverses the property. This channel was reached in the Parry or Alki incline in SE $\frac{1}{4}$ Sec. 18, T. 23 N., R. 4 E., but reports are conflicting as to whether or not it was actually bottomed; it was found to contain large washed boulders and coarse granitic sand. There was a heavy flow of water. It was thought in 1890 that the channel bedrock had been reached,¹ but in 1892, the incline had been advanced 500 feet farther, "without, however, tapping the old back channel that courses north of northeast."²

The elevation of 'supposed bedrock' reached was 1630 feet according to Lindgren;³ according to a map by Kay, the elevation at the collar was 1850 feet and at the bottom 1647 feet. In any event, it has

¹ Calif. State Min. Bur. R. X, p. 141.

² Calif. State Min. Bur. R. XI, p. 161.

³ U. S. Geol. Survey P. P. 73, p. 92.

not been profitably worked although it might be supposed, from geological reasoning and comparison, to be gold bearing as it traverses several auriferous formations, and has eroded a longer and deeper watershed possibly than other channels that have produced well.

The company has started an adit from the west bank of West Branch of Feather River in NE $\frac{1}{4}$ of Section 30. They estimate this will have to be run about 3200 feet to reach the channel. By the middle of July this had reached a distance of about 600 feet. It was planned to have it continued under contract at about \$15 a foot. It is 7 by 7 feet in cross section and so far in serpentine.

The adit is 1.2 miles by new private road from the Magalia road at a point 1.1 miles north of Magalia. Electric power has been brought in over one-half mile of new line. An air compressor (14 by 12), (9 by 12), operated by 75-h.p. motor, drill sharpener, oil-fired forge, and blower have been installed and several buildings erected. Fifteen men were employed in May, but the force was reduced with the completion of surface work.

Hupp Placer property comprises 480 acres in NW $\frac{1}{4}$ Sec. 1, N $\frac{1}{2}$ of SW $\frac{1}{4}$ and N $\frac{1}{2}$ Sec. 2, T. 23 N., R. 3 E., a mile north and east of De Sabla. Mrs. Hupp, De Sabla, owner. G. F. Skelton, 5031 Rio Chico Way, Chico, has an option.

The Indian Springs adit was run upstream on the channel for about 700 feet on the Hupp ground, when stopped by injunction. Another channel (see Nugget) was worked by a shaft 80 feet deep and an incline from it in NW $\frac{1}{4}$ of NW $\frac{1}{4}$ Sec. 1, but work had to be suspended on account of water, after a reported production of \$9,000.

Indian Springs Drift Mine comprising 140 acres in Sees. 3 and 10, T. 23 N., R. 3 E., near De Sabla, was one of the profitably productive mines of the county. The last work was in 1920-1922 when Henry S. Porter had a lease on the property and E. F. Woodworth directed operations. The old working adit was repaired and was being advanced when the owner of the adjoining Hupp holdings sued for an injunction and work was stopped, after the adit is reported to have passed into the Hupp ground 700 feet, going upstream.

The old Indian Springs adit was started in 1860 and worked continuously for over 30 years, and finally reached a length said to be 6500 feet including turns, but showing 5200 feet long on a section. As described by E. B. Preston¹ the gravel breasts were 120 feet wide by 6 feet high and contained about 50 per cent cobbles and boulders. A shift's work for a miner was three carloads of gravel of 1500 pounds each, which yielded \$7 to \$8 a carload then. The average for the mine as a whole was less.

According to a map made at a later date than the above, there was a section of this channel about 750 feet long which was faulted down and where former work stopped. Work done under Woodworth passed through this faulted section, encountering a copious flow of water, which continued for five months. Pay gravel was reported, but obviously the expense of operation was high and the adit was expensive to keep open. A long section of this channel and its two supposed tributaries is believed to remain unworked on the adjoining properties

¹ Cal. State Min. Bur. R. XI, p. 159.

upstream belonging to Mrs. Hupp, Mrs. M. M. Understock et al., and Diamond Match Company. The face of the adit is 197 feet above the portal, indicating an average grade of nearly four per cent.

Kanaka Bar. W. E. Livesley and Bert Knapp of Oroville were reported to be preparing to build a barge here in June. An engine and a pump were to be mounted on it, and the gravel in the river was to be prospected with the pump, guided by a diver. This method has been followed on Feather River and American River before, and such an installation was described by the writer in the last Placer and El Dorado counties reports.

Kelly Hill Mine. Operated by Gold Wedge Divide Mining Company, Frank G. Steward, president, Russ Building, San Francisco. T. V. Barton, superintendent, Chico, c/o De Sabla stage. It is in Secs. 27 and 28, T. 23 N., R. 3 E., two miles south of De Sabla.

Four bedrock tunnels were run by previous operators. The present company have done considerable prospecting and have found coarse gold at times, but have been unable to follow any defined pay streak on account of pay being in a few large pieces. It appears as if the pay streak, coursing southwest had been crossed by later gutters, leaving pay in patches between the gutters and high on their rims, according to R. L. Phillips; Barton interprets the occurrence as a 'fingering out' of the gravel, as might occur in a delta. No work was being done at time of visit and these workings were not visited.

Barton was preparing to prospect a heavy bank of intervolcanic gravel lying about one-half mile west of the Kelly Hill Mine above the road, where a side canyon had cut the gravel. This has been worked from time to time by prospectors seeking a grubstake. The part carrying fine flaky gold is three to seven feet thick, containing greenstone cobbles mixed with lava mud and sand, has a lava roof and lies on a floor of cemented cobbles. It apparently filled so rapidly that there was no time for stratification. It is tight enough to require milling. There is an adit here about 400 feet long from which considerable gravel has been breasted. There is a 15-h.p. gasoline engine and small air compressor here. Three men were employed outside June 15.

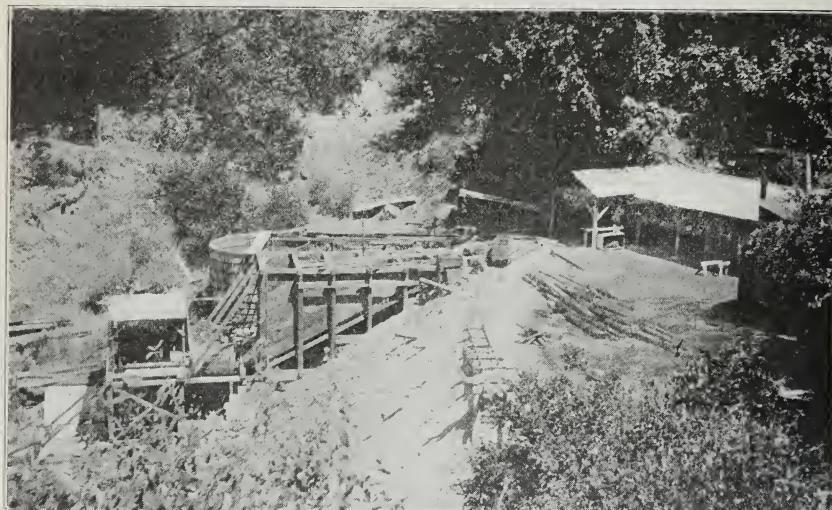
Little Butte Prospect is on Little Butte Creek one mile north of the Steiffer Mine. There are 80 acres of unpatented claims covering quartz and placer prospects. The latter lie along the creek where some ground on a flat of several acres has been partly prospected. J. and O. Van Ornum, John Smith and Jess Triplet, Box 38, Route 3, R. F. D., Chico, owners. One man was doing assessment work in June.

Lucky John Drift Mine. Enterprise Gold Mining Company, owner. A. J. Martens, president, 2902 Nineteenth Street, San Francisco. It contains 360 acres of placer mining ground and 30.67 acres in recently located claims, in Secs. 2 and 11, T. 22 N., R. 3 E., two miles north of Paradise. Most of the work has been done in the NW $\frac{1}{4}$ of NW $\frac{1}{4}$ of section 11. Arthur Delerey, superintendent.

The work done up to that time was described by the writer in our June, 1922, issue of MINING IN CALIFORNIA. The main working adit, running south and southeast, had reached a length of 566 feet then, and payable gravel had been opened near the face for a length of 100 feet, as well as at the top of a raise put up 45 feet vertically at a distance of 257 feet from the portal. Since then, the gravel opened in

both these places has been worked a little. The gravel on the main level was breasted for a maximum width of 60 feet and some branching drifts were run east 70 feet and west and southwest as much as 110 feet from the main crosscut, showing a width of over 100 feet of gravel. The bedrock pitches south to S. 20° W. It is reported to have paid for two feet next the bedrock in the pay streak. In breasting upstream from the main level a U-shaped bend was made and a steep tributary or gutter was followed 385 feet north. This, called the Blue Raise Channel, raised 44 feet in 385. It was breasted 10 to 25 feet wide. The face is scarcely 80 feet from the face of an old adit.

The 'Red Channel' was struck first in the raise from the main adit 257 feet from the portal, and again in a raise driven 100 feet west up the steep west rim of the 'Blue Raise Channel' 330 feet north of the turn from main adit. It is 26 feet higher here than the 'Blue Raise Channel.' This upper gravel has been worked for a length of 105 feet



Lucky John Drift Mine, near Paradise, Butte County.

southeast of the last raise, and 6 to 10 feet wide. It is older gravel than that below, the gold is coated with a rusty covering and the east rim is flat. This run may be an early bench. A raise is being put up to tap it in the south workings. The west rim was not seen, but there seems to be little doubt of the channel character of the gravel, although the old beach line is close, on the Mineral Slide property. This gravel is loose and has a great deal of sand.

The bedrock of the mine workings is Calaveras (Carboniferous) and Mariposa (Jurassic) slate, striking northwest and dipping northeast. About 700 feet in the adit going north to prospect the main channel, the adit crosses a quartz stringer lead in Mariposa clay slate. This lead is 20 feet wide, and a little specimen ore is reported in it, at the crossing, but no further work has been done on it yet. An auriferous lode system, reported 60 feet wide, strikes northwest 500 feet ahead of the north face.

Equipment includes two 5000-gallon tanks, a 14,000-gallon reservoir, 150 feet of 12-inch sluice, gravel bin of 50 cars capacity, two screens, one-drill compressor and electric motors. Seven men were employed in June, 1928.

Lydia Placer Mine was profitably worked by Dave Campbell, owner, Coutolene, until deprived of a cheap water supply. This claim is on the Nugget channel just upstream from the Nugget Mine. Campbell states that pay was found on the short side of bends on high bars, but that the main channel carried no pay. Ground sluicing and drifting were employed. The channel here was only about 20 feet below the surface. A length of 250 feet out of 750 feet of channel on the property has been worked.

Mineral Slide Gold Mining Company's property contains 390 acres in N $\frac{1}{2}$ Sec. 10 and S $\frac{1}{2}$ of Sec. 3, T. 22 N., R. 3 E., 3 miles southeast of Magalia.

The holdings face on Little Butte Creek canyon for a length of a mile and extend south one-half mile. It has been worked intermittently for a long time, during which ten adits have been run, as follows:

No. 1, run 1200 feet a little south of east from Van Fossen Ravine, is partly caved. It started 575 feet northeast of the west $\frac{1}{4}$ section corner, going from bedrock into gravel.

No. 2, 300 feet long, all caved, showed gravel with a prospect of gold at the face, but it was too high. It started near the north $\frac{1}{4}$ section corner between sections 10 and 3.

No. 3 was run south then east, over 500 feet, passed through some old works and showed gravel 80 feet wide running \$1.50 a cubic yard.

No. 4 is about 200 feet east of No. 3, and is 170 feet long with a raise of 10 feet to gravel in which it continued 127 feet. This paid well.

No. 5 adit paid well. It showed gravel and bedrock dipping south and west.

No. 6 is an early day adit, too high and caved. Adits 4, 5 and 6 are, in order, 200 to 250 feet apart and east of No. 3.

No. 7 is a double track tunnel 1260 feet long running southeast and connecting by a raise of 36 feet with No. 8, an incline running southwest 1200 feet. From the connection the incline was continued 400 feet. From these workings a large amount of gravel yielding from \$1 to \$10 or more a yard was mined. This was in part cemented or tight, and was washed four times, each washing yielding part of the gold, the total amount having been evidently \$3 a cubic yard. Workings are caved.

No. 9 adit was started on the Lucky John property just east of the east line of the Mineral Slide, but entering the latter property almost at the southeast corner, then passing back into the Lucky John. This adit, now caved, is said to have shown pay gravel near the face. This is undoubtedly the same channel since developed a little farther east in the Lucky John Mine (which see).

No. 10 adit, started about midway of the property near the north line, between No. 2 and 3 adits, was run 1200 feet or more south, with the intention of extending it to the south property line and furnishing drainage and a working entry from which the property could be worked to advantage. It was to be on sluice grade of 5% to permit washing in boxes from the face. It was not completed and the property has lain idle 12 years or more.

The Mineral Slide property lies along a part of the Ione shoreline, the gravels lying partly on slate and partly on Cretaceous sandstones.¹ The sandstone below the gravel has yielded Chico (upper Cretaceous) fossils. The bedrock of the gravel sinks rapidly on this property from an elevation of 1500 feet on the north to about 1000 feet on the west, and there is an immense deposit of low grade gravel. On the rims and possibly also along gutters in this deposit, the good pay was found. The Lucky John Mine, immediately east, shows a defined channel on slate bedrock in their northerly workings without the evidence of marine action.

Mountain House Drift Prospect contains 20 acres in the center of Sec. 4, T. 21 N., R. 6 E., three-fourths mile from Mountain House on the creek of the same name. August Amend, owner, Berry Creek, c/o Mountain House.

This covers an old back channel of the creek, buried by an ancient landslide. It was drifted by former owners for 250 feet, when the workings were lost on account of water and running ground. It was reported to be rich. There is a distance of 1100 feet believed to remain unworked on the claim between the points where the present stream cuts the old channel.

The present owner has been working alone for several years, aiming to strike the channel with a bedrock adit which will drain the ground. The exact course of the old stream under the slide is uncertain and previous adits, including one 350 feet long, did not reach the objective, but the present working, now 200 feet long, is believed to be under the gravel, which will be tapped by a raise.

The *Nugget Drift Mine*, in S $\frac{1}{2}$ Sec. 36, T. 24 N., R. 3 E., was opened on the Nugget channel at Toadtown, and worked downstream at a profit for 200 to 300 feet. The present upper course of Little Butte Creek crosses this channel at Toadtown. The gravel carried pay distributed over a width of 60 feet. Mrs. Julius Smith, owner, Chico.

This channel passes downstream into the *Hupp* property, where a shaft and incline were sunk on it. Upstream, it enters the *Lydia* mine and passes from there into the *W. H. Walker* claim. This is locally considered as being probably a branch of either the Perschbaker or Indian Springs channels.

Oro Fino Mine. Robbers Roost Mining Company, W. F. Anderson, general manager, 903 Hobart Building, San Francisco. The company owns 360 acres in Secs. 10 and 11, T. 23 N., R. 3 E., just west of De Sabla, and has a lease and option on other land adjoining. Nat Lambert, superintendent.

The old Robbers Roost workings are in section 10, midway between the Emma and present Oro Fino workings. The Robbers Roost adit was about 2500 feet long with 1500 feet in length breasted; a small channel now being worked was also found there.

The total distance from the portal to face of main Oro Fino adit is 5800 feet. Present work is carried on through an incline shaft with a vertical depth of 125 feet, striking this adit 1300 feet from portal and at an elevation of 2250 feet. The old workings of the Oro Fino are described in past reports of the State Mining Bureau, in which the

¹ U. S. Geol. Survey A. XVII, pt. 1, p. 545.

width of pay gravel in the main run was given as 40 to 50 feet. The grade was steep and the pay is said to have been mostly on the serpentine bedrock. A small branch was struck 750 feet in and was worked; in a length of 225 feet, it rose 70 feet. The gravel in 1888 was said to pay \$5 per 1800-pound car or \$40 per shift per man.¹ In 1892, it was said² to pay \$100 per man. In 1896 the main adit was 2700 feet long. Evidently the bulk of production was made by those former operators. The present company has had the mine 15 years, but has not made much production as they have been running mostly through old ground and bedrock, in search of the Emma channel.

The present main adit, which runs southeast and east, raises 110 feet in a distance of 3000 feet from the foot of shaft to junction with a small branch channel entering from the northeast. The main adit has been run about 1500 feet beyond this. Two faults with downthrows of nine and seven feet on the east side were crossed. At the face, they struck a third fault, also with downthrow on the east side. They have been sinking an incline here, which was 56 feet deep vertically early in June. Lambert thinks these are the same faults found in the Indian Springs Mine, three-fourths mile northwest, and expects to sink about 25 feet deeper before reaching the level where he can continue crosscutting. Work here had been suspended while awaiting a pump. Five men were running a drift upstream on the branch channel last mentioned. This had been followed at time of visit (June 14) for 500 feet and had raised 40 feet. It runs on serpentine bedrock, carrying black and rust-stained gold. The pay is 4 to 12 feet wide. Coarse, rough crystallized gold in subangular quartz is common. The face seen was in coarse sand, with from a few inches to one foot of gravel next the bedrock.

A line of 12-inch sluice boxes with riffles traverses the entire length of the workings nearly to the working face. Water is brought into the mine in a pipe line (8-inch outside diameter) from a reservoir below De Sabla, giving a pressure head of 326 feet at the working face. The face is bored with augers and after blasting with light charges the gravel and sand are washed with a hose into the sluices. The gold lodges on the bedrock and in the first few boxes, and tailings are carried out the adit. This is a cheap and rapid method of working, which has been adopted in some mines in this county where channels are steep enough to permit tunnels on a sluicing grade.

Electric power is available for pumping and lighting and a blower operated by water power is used for ventilation.

No description of Butte County placer mines could be concluded without mention of the *Perschbaker (Magalia or Lucretia) Mine*. It is in Secs. 13 and 24, T. 23 N., R. 3 E., $1\frac{1}{2}$ to 3 miles north of Magalia by road.

The first discovery was made by Birch and Barrett in 1855 on the bank of Little Butte Creek in SW $\frac{1}{4}$ of SE $\frac{1}{4}$ of Sec. 13, T. 23 N., R. 3 E., where rich gravel was found almost at creek level alongside a massive quartz vein. They followed this downstream in a westerly direction but after taking out rich pay lost their rights, which were acquired by Perschbaker. The latter continued the incline, following this channel, which proved to be a branch of another. The work was done under

¹ Calif. State Min. Bur. R. VIII, p. 118.

² Calif. State Min. Bur. R. XI, pp. 160-161.

great difficulty on account of water, a steam plant of four 4-foot by 16-foot boilers being required to run the ten pumps needed. This channel, only 4 to 20 feet wide¹ and with a meager amount of gravel, most of it subangular, was followed 3500 feet, in which distance it dropped 282 feet, the grade varying from 12% to 3%. It was very rich, coarse gold being plentiful.

In 1890, the property changed hands again. A perpendicular shaft 502 feet deep, was sunk one-half mile or more west of the discovery point, after the difficulty of working downstream in the incline became too great. The so-called Little Magalia channel, of which the Perschbaker was said to be a tributary, was worked downstream from this shaft 3950 feet, and upstream nearly 2000 feet, nearly or quite to the Campbell (now Steiffer), at a good profit. This channel was 50 to 60 feet wide with pay gravel up to six feet above bedrock, which was slate alternating with serpentine.² Two faults were encountered going downstream. Both showed upthrows on the south side, one of 5 feet and the other of 34 feet. The boulders from this channel appear to have been mostly greenish schist, serpentine and slate. Many interesting stories of the richness of the gravel are told. The production was no doubt over \$1,000,000.

When the work on the north had reached the vicinity of the Joe Campbell property line, Campbell obtained an order from the court for a survey. The mine was at that time (December, 1899) allowed to fill with water and has since been idle.

The downstream portion of this channel has not been certainly identified and its course is not known.

Pitts Mine (Old Bader, or Mowry & Newman). It is in sections 1 and 2, T. 22 N., R. 3 E., a mile and a half from Magalia by road and trail. Owners, Mowry and Newman, San Francisco. Lessee, Lillian Mining Co., Maurice Reich, president, 125 Geary Street, San Francisco. J. M. Pitts, superintendent, Paradise.

The lessee has been prospecting the property since December, 1920. The work done up to June, 1922, was described in the report of the State Mineralogist for 1922, pages 260 and 261. The claims had been previously worked by hydraulicking and by a series of adits and are said to have made a production variously stated at from \$75,000 to \$200,000, but no definite records were shown to substantiate this. Since 1920 there has been little production.

Geological conditions here are mainly similar to those observed in the Bader Mine (which see). The same channel has been prospected. No. 1 adit, started at an elevation of 1930 feet (aneroid), was about 3000 feet long in July, 1928. Above it and to the south, raises and drifts have been run. The Reich raise reached a point nearly 70 feet higher than the portal on the east rim of the channel. The Pitts drift was run from the top of a raise from the main entry level, southward 200 feet. Another drift reached a point 300 feet south, where considerable water was struck. Here there is a lava-filled cut in the bedrock of the east rim, suggesting interesting geological possibilities in that direction. The present lower workings are not low enough to properly bottom the ground downstream.

¹ Cal. State Min. Bur. R. XII, p. 87.

² U. S. Geol. Survey Prof. Paper 73, p. 93. Waldemar Lindgren.

From time to time, patches of payable gravel, containing one or two carloads each, have been found but the operators have not solved the problem of locating any definite pay streak, if such exists. The pay probably occurs in small streaks or gutters; the gold is coarse and coated black. The channel is not so well defined here as at the Bader Mine, as here it is much nearer the ancient shore-line.

There is a gas engine, blower and air-drill equipment on the claims, but recent work has been by hand, with three or four men employed.

A quartz vein 2 to 5 feet wide crosses the north end of the property.

Robison Drift Prospect is in Sec. 15, T. 24 N., R. 3 E., about three miles by road and trail from Berdan. W. A. Robison, Chico, c/o Forest Ranch, is in charge of prospecting, with a few men employed.

Royal Drift Mining Company prospected the property, working three shifts for several months, but gave up their lease. This prospect was not visited. Workings are reported to include an adit about 1200 feet long, which was 25 feet too high to bottom the channel, necessitating an incline, through which the later of the two channels described under the Dix Mine was prospected, and search is being made for the other.

Rotten Boulder Drift Mine is in the NW $\frac{1}{4}$ Sec. 29, T. 22 N., R. 4 E., six miles from old Yankee Hill by Jordan Hill road and trail, on the east side of West Branch of Feather River. Knox Brothers, owners, Magalia, have been working the property and have run an adit nearly north 450 feet at an elevation of 1425 feet (aneroid). This follows a steep channel in a narrow winding trench with numerous large, hard boulders. The stream evidently followed a soft seam in a belt of schist or a dike; the face is entirely in bedrock or rotten granitic rock. The owners report a small production the past year.

Equipment includes a tractor, gasoline engine and vertical compressor. The Blue Hog Mine workings, perhaps on the same channel, but downstream and on the opposite side of the river, bear S. 70° W., about one-half mile and 175 to 200 feet lower.

Royal Drift Mining Company. R. M. Butler, Napa, California, president; Forest Snow, superintendent. The holdings cover nearly 800 acres for three miles along the lava-covered ridge west of Big Butte Creek in Secs. 27 et al., T. 24 N., R. 3 E., 23 miles from Chico via Forest Ranch, or eight miles by road and trail from Magalia. Present work is in the SW $\frac{1}{4}$ Sec. 27, at 2350 feet elevation (aneroid).

The property, once called the Best Mine, was opened in 1879 by Best and Garland and they are thought to have produced about \$35,000. The Napa and Solano Mining Company worked between 1890 and 1900 in the same adit now being used. They raised 30 feet above this when 650 feet in, and boasted a reported length of about 600 feet, for a width of 50 to 100 feet and a height of 5 to 6 feet. The present company has been in existence 20 years. Besides the work here, they ran an adit 1400 feet long in section 34, an adit 3000 and an incline 900 feet in Sec. 4, T. 23 N., R. 3 E. They have extended their present adit 2500 feet.

This main adit, starting in a westerly direction, branches 1500 feet in. One branch has been driven N. 8° W., 35 feet to a raise 12 feet high, from the top of which a crosscut was being run S. 45° W., to prospect a section of an early run of the Best channel, of which Snow

thinks there may be as much as 3000 feet remaining. This work was 200 feet in, and was still in bedrock, when visited.

From the fork, the main adit continues 1900 feet N. 64° W., where a fault was encountered; an incline was sunk 300 feet (90 feet vertically) but had not reached the opposite side of fault when the incline was lost, and a sudden flow of about 20 miners' inches of water filled it. This water still flows, only partly reduced in volume, and is used for washing gravel. As usual in this region, the low side of fault is on the upstream side. This channel is locally believed to be the Dix channel, not yet bottomed on this property. The amount of faulting is uncertain, but may be 175 feet.

At a point 1300 feet from adit portal, a crosscut was run 40 feet and an incline was run 300 feet (25 feet vertically) down the bed of a late run; a crosscut thence northwest 100 feet struck an older channel on nearly the same level. It was followed upstream 100 feet and about 200 cubic yards of gravel that paid \$5 a yard in coarse gold was mined, when the channel steepened and work was stopped.

Four men were working underground, and several on the surface. A 25-h.p. semi-Diesel engine drives an 8½" by 12" air compressor, and a 7-h.p. engine runs an air blower. A McCormick gravel mill is used to wash gravel which is tight.

Steiffer Mine (formerly Joe S. Campbell P. M.). P. B. Steiffer Mining Company, owner, North Ivy Street, Chico. The mine is in Sec. 13, T. 23 N., R. 3 E., and contains 80 acres; members of the Steiffer family control it as well as mineral rights on SW¼ Sec. 12, (105 acres), SW¼ Sec. 1 (140 acres) and W½ of NW¼ Sec. 12 (70 acres).

The Steiffer shaft in E½ of NW¼ Sec. 13, was sunk vertically 334 feet and an incline was started at a point 20 feet north of the bottom of shaft, and was sunk toward the west on an angle of 45°. At 50 and 100 feet, layers of barren gravel were cut. At 100 feet they struck the contact between lava and bedrock, where the angle of incline was changed to 15°, it was sunk 250 feet farther, and pay gravel was found on serpentine bedrock at a vertical depth of 508 feet from the portal, or at an elevation of about 2070 feet. A flow of 580 to 600 gallons of water per minute had to be pumped. The channel was crossed to west rim, a distance of 60 feet. A drift was run downstream 40 feet. A drift was started north and a crosscut was run west 200 feet in serpentine bedrock all the way, in search of another channel, but nothing was found. The main drift north in the center of the channel was run about 170 feet, and is claimed to have been in gravel carrying gold. The company worked intermittently until 1917, but the total length worked up to 1914 was only 250 feet. Great difficulty was experienced in keeping the mine pumped out, due to amount of water and to litigation which interrupted operation as well as a number of accidents which cut off the electric power used for pumping. Two hydroelectric power plants were built on the West Branch, but for many years little mining was done.

In 1921 the Evening Star Mining Company unwatered the mine again and did some work but quit in financial difficulties without paying the men. The workings were again under water shortly after they quit, and have remained so since. One of the men then employed there stated that the upstream face was about 900 feet upstream from the face of the old Magalia drift, which is supposed to be about 200

feet from the Steiffer shaft. The former employees were given an opportunity to work gravel then exposed, to obtain wages due them. One of these men stated in 1922 that they had a breast of gravel 20 feet wide by 7 feet high worth \$13 a cubic yard in place, but could not make it pay due to the number of men needed for surface work, hoisting, etc., with only four or five at the face. Two hoists had to be operated.

Underground equipment during the Steiffer regime included 10 centrifugal pumps of 700 gallons per minute capacity, one of 1000 gallons per minute and 2 steam pumps of 600 gallons per minute capacity. The hydroelectric power plant on the West Branch had a rated capacity of 700-h.p., but the water supply was not always enough to run it. The transmission line has been stripped of wire. Other equipment now at the shaft, in buildings, which are in poor repair, includes 3 boilers, 10" by 12" compressor, double hoisting equipment (steam and electric) and an old style 52-h.p. motor.

The Steiffer workings are claimed by the owners to be on the upstream extension of the Little Magalia channel, which was worked up near to the property line previous to 1899.

IRON

Prospects of iron ore found in Butte County have been mostly in the form of float. The following were mentioned in Bulletin 38: Sec. 5, T. 25 N., R. 4 E., at an altitude of 6000 feet, float. Secs. 7 and 27, T. 23 N., R. 4 E., float. Sec. 30, T. 25 N., R. 5 E., heavy iron float. Secs. 5 and 8, T. 25 N., R. 4 E., old locations.

A vein in Sec. 3, T. 22 N., R. 3 E., in serpentine bedrock is said to carry 60% iron, 5% to 8% manganese and a trace of chromite.

LIMESTONE AND MARBLE

Small bodies of limestone and marble occur in the eastern half of the county where the bedrock formations are exposed, as near Pulga and Intake; and between Pentz and Yankee Hill, where some quarrying and burning of limestone was carried on 25 to 35 years ago.¹ The last recorded production was in 1903.

Other properties mentioned in our Bulletin 38, page 98, are noted below. Several are too far from railroad to be utilized except locally.

Big Bend Marble Quarry in Sec. 32, T. 22 N., R. 5 E., described as showing a ledge of blue limestone, and another of white marble. It is near Intake on Western Pacific Railway.

Marble Creek Deposit in Sec. 10, T. 22 N., R. 6 E., a "heavy cropping of white marble." This is a little east of Merrimac. A logging railroad passes within two miles of several small lenses of limestone which occur almost on the county line.

Mooretown Marble is in Sec. 24, T. 20 N., R. 6 E., two miles southeast of Mooretown. Described as a "ledge of white marble."

Pentz Marble is in NW $\frac{1}{4}$ Sec. 8, T. 21 N., R. 4 E., about five miles northeast of Pentz. The ledge is said to extend for a mile northwest through the center of this section. Some lime was burned here many years ago.

¹ Cal. State Min. Bur. R. XI, p. 157.

Other bodies of limestone have been noted in Secs. 7, 17, 18, and 20, T. 21 N., R. 4 E.

MANGANESE¹

Bear Canyon Mine. George W. Wooley, owner, Clipper Mills. In Sec. 35, T. 20 N., R. 7 E., one-half mile northwest of Clipper Mills. An orebody of manganese oxide containing 40% ore, produced 220 tons when worked in 1916 by Noble Electric Steel Company. Idle now. The property is 32 miles from Oroville, nearest railroad point.

Powell Prospect. E. V. Powell, Clipper Mills, last known owner. It is in Sec. 35, T. 20 N., R. 7 E., one mile north of Clipper Mills. A siliceous, manganese-bearing ledge was reported in 1917.

View Point Prospect, owned by E. C. Binet, Clipper Mills, is in SE $\frac{1}{4}$ Sec. 34 and SW $\frac{1}{4}$ Sec. 35, T. 20 N., R. 7 E., three-fourths mile northwest of Clipper Mills. Only a little shallow work has been done, showing prospects of siliceous manganese ore.

Jack Johnson, Magalia, found manganese ore in the county and listed same in our Monthly Commercial Mineral Notes during the present spring. Though many inquiries were made and samples submitted to those interested, it is said these proved too siliceous. In Johnson's absence, his associate refused information as to the location of the prospect.

MINERAL PAINT

Chico Ocher and Mineral Paint Company. Owners, Mrs. Frank Henshaw and Hochheimer and Company, Willows. An ocher deposit occurs on 360 acres of land in Secs. 5 and 6, T. 23 N., R. 4 E., near the Doon road and a mile from the Southern Pacific Railroad.

There was some production previous to 1900. The deposit was worked through an adit 200 feet long and a small open cut.

MINERAL SPRINGS

Mineral springs of the county are described and analyses of their waters are given in Water Supply Paper 338, U. S. Geological Survey.

Mt. Ida Spring is six miles east of Oroville. It supplies a carbonated water which has been used locally and has also been bottled.

Richardson Springs are in the canyon of Mud Creek ten miles northeast of Chico. There are four principal springs and a smaller one. They are classified as saline springs, some of concentrated character. One spring in particular carries considerable sodium, a moderate amount of potassium and calcium, and marked amounts of the chloride and sulphate radicals.

A popular and successful resort has been built up around these springs, with hotel accommodations for the large numbers who use the water for medicinal purposes. Water is also bottled. *Natural gas* from one of the springs is trapped and utilized in the hotel.

PLATINUM GROUP METALS

Platinum, iridium and other members of this family of metals, were recovered to the amount of 100 ounces or more annually when gold

¹ Cal. State Min. Bur. Bull. 76, pp. 30-31.

dredging was in full blast, but in later years this has dwindled to only a few ounces a year.

The platinum metals taken on the dredgers occurred in small, thin flakes carrying 68% to 72% platinum and about 20% osmiridium. These metals have also been noticed at some of the drift mines, and there has been a small output from the surface placers and river bars on the upper course of Feather River.

Bibl: Cal. State Min. Bur. Bull. 85.

SILVER AND LEAD

Bonanza King Prospect. Owner, John Wells, Yankee Hill. In May, 1928, an option was held by Lloyd Root, San Francisco, and it is reported he and others have recently started work. This prospect of four claims is in Sec. 16, T. 25 N., R. 5 E., about six miles east of Chapparal at a reported elevation of 6000 feet.

Wells has done assessment work for several years, in the course of which a prospect shaft reached a depth of 24 feet and a few small shipments of a ton or less each of sorted ore were made. This came from a streak reported about 16 inches wide in a wide vein. The property was not visited.

A shipment of 2230 pounds in 1924 gave 0.57 oz. gold, 112.58 oz. silver, 4.65% copper, 53.4% silica, 1.8% iron and 2.6% alumina (Kennett smelter). Another lot of 1720 pounds shipped in November, 1927, carried 0.71 oz. gold, 96.65 oz. silver, 8% lead, 3.4% copper, 6.4% zinc, 2.1% antimony, 0.1% arsenic, 2.7% iron, 61.6% insoluble. After all charges and deductions, the net return on the latter lot was \$39.68 (Selby smelter).

Stirling City, the nearest railroad point, is 20 miles distant. The mine is connected by a steep trail with road.

The ores of a few other prospects in the northeastern part of the county carry lead and silver.

STONE INDUSTRY

There are three plants in the county which produce crushed rock, sand and gravel from the piles of dredger tailings near Oroville and Chico. The supply of such material is immense.

Bechtel-Kaiser Rock Company, Oroville, has recently installed and put in operation a rock crushing plant about two miles south of Oroville.

Coast Rock and Gravel Company. Main office Hunter-Dulin Building, San Francisco. The Oroville plant is within the city limits. It belongs to Natomas Company of California and is operated under lease. H. W. Thorne, superintendent.

This plant has a daily capacity of 1000 tons of crushed rock and 1000 tons of gravel. Crushed rock is produced in standard sizes from 2½-inch to dust, gravel $\frac{1}{4}$ " by 2", $\frac{1}{4}$ " by 1" and pea gravel, besides which special sizes can be supplied.

Rock is loaded by steam shovel and hauled a mile and a half in 6-yard and 12-yard cars by gasoline locomotives. The scalping screen separates rock for the crushers, of which there are one 36" by 24", one 36" by 18" and two 36" by 10". The larger rocks go to the first of these, while that from two to four inches goes to the 36" by 10"



Plant of Coast Rock and Gravel Company at Oroville.

crushers, and minus 2-inch gravel goes direct to the washing screen. Rock and gravel is stored in bins and stockpiles. There are spur tracks from both the Western Pacific and Sacramento Northern Railways. Thirty-five men are employed.

Johnston Rock Company, Chico. J. E. Johnston, manager. This rock crushing plant is utilizing old dredger rock piles left by El Oro Dredging Company on Butte Creek about a mile and a half from Chico.

TALC AND SOAPSTONE

These are widely distributed in those parts of the county where the bedrock formations are exposed, but many of the deposits are a considerable distance from railroad and are undeveloped. Soapstone is a common mineral in the state and in other counties deposits near railroad have supplied the demand, with consumers in a position where they can choose from a number of available sources of supply at a low price.

Soapstone occurs in the vicinity of serpentine dikes and amphibolite schist which traverse the county at intervals striking northwest, and is exposed in some of the deep canyons and along the higher ridges where these are not covered by lava. Another rock commonly called soapstone but different in its rock associations from the above and really a mica schist, is found in some of the older rocks of the higher mountains, but has been used only a little locally for fireplaces.

McLean Soapstone Mine contains 19 acres in Sec. 32, T. 22 N., R. 5 E., on north side of North Fork of Feather River midway between Intake and Blinzig, on Western Pacific Railway. Walter S. McLean, 1919 San Bruno Avenue, San Francisco, owner.

This is one of the first class of deposits mentioned. Because of favorable working conditions, and nearness to the railroad, McLean has been able to produce cheaply. The rock is shipped to the bay cities for use in roofing, etc.

REDDING FIELD DIVISION

CHAS. VOLNEY AVERILL, Mining Engineer

TEHAMA COUNTY

Geography and Topography

Tehama county lies in the north central portion of the state, and is practically entirely within the basin of the Sacramento River and tributary streams, just a little south of the point where the river emerges from a narrow cañon to enter a broad valley. The central portion of the county is traversed from north to south by the Sacramento River with a broad expanse of lowlands, but the mountains on both the east and west edges of the county rise to elevations of upwards of 7000 feet. The lowlands are devoted to diversified farming, and much of the other land is suitable for the raising of sheep, cattle and hogs, so agriculture is the chief industry of the county. Other industries of some importance are the development of hydroelectric power from the streams flowing into the Sacramento from the east, by the Pacific Gas and Electric Company, and lumbering by such concerns as the Red River Lumber Company and the Diamond Match Company. Transportation is furnished by the Southern Pacific Railroad, following in a general way the course of the Sacramento River, and a paved highway following the same route, with good graveled branch roads running out to the east and west.

Geology

In general, a study of the geology¹ of the county shows that a belt of Jurassic metamorphic rocks, including a band of serpentine, runs north and south through the western part, a belt of recent clays and gravels deposited by the Sacramento River runs in a similar direction through the central part, and the eastern portion is covered by Tertiary lavas. On either side of the river deposits, an area of Tertiary sedimentary rock exists. With the lava covering the eastern portion and the river deposits covering the central portion, it is not surprising than few mineral deposits are found in Tehama County.

Mining

Mining is practically at a standstill in Tehama. The last report on the county is contained in Report XV of the State Mineralogist, which is now out of print, so the resources of the county are reviewed here, with added notes on recent developments of interest.

Among its mineral resources are listed: brick, chromite, copper, gold, manganese, marble, mineral water, salt and miscellaneous stone.

The table herewith gives the total recorded output of mineral products from 1880 to 1927, inclusive.

¹ Cal. State Min. Bur. Bull. 72.

Year	Gold, value	Chromite		Brick	
		Tons	Value	M.	Value
1880-1884	\$22,000				
1894		1,680	\$12,680		
1895		950	9,025		
1896		56	475	500	\$2,500
1897					
1898				200	1,400
1899				300	1,800
1900				325	2,200
1901				300	2,000
1902				500	3,500
1903				600	4,500
1904				500	3,500
1905				650	5,000
1906				700	5,600
1907				400	3,200
1908				400	3,000
1909					
1910				600	3,600
1911					
1912				225	1,300
1913				300	1,800
1914					
1915				400	2,700
1916		1,896	39,702	²	
1917		2,053	41,646		
1918		3,261	152,291		
1919		²			
1920					
1921					
1922					
1923					
1924					
1925					
1926					
1927					
Totals	\$22,000	29,896	\$255,819	26,800	\$47,600

¹Includes crushed rock, rubble, sand, gravel.

²See under 'Unapportioned.'

CHROMITE

Chromite is found associated with the belt of serpentine which runs through the western portion of the county in a general north and south direction. *Kleinsorge Property*. In Sec. 27, T. 25 N., R. 7 W., Wm. E. Kleinsorge, attorney, of Sacramento, owns a mine which produced chromite during the late war, but which is now idle and in the hands of a caretaker.

Savage Bros. Lease. On the recommendation of S. D. Furber of Red Bluff, J. C. Savage and I. J. Savage of Red Bluff, have made application for a lease on state land in Sec. 16, T. 25 N., R. 7 W. They expect to mine high grade chromite from lenses in the serpentine and also to mine rock in large quantities through which the mineral is disseminated. They will concentrate the chromite from this material with machinery installed on the property by former owners, but will drive the machinery with water power instead of with gasoline engines, as was formerly done. They also expect to exploit deposits of magnesite. This property was formerly operated by the Noble Electric Steel Company.

CLAYS

O'Conner Brothers of Red Bluff are owners of a clay deposit in Sec. 29, T. 27 N., R. 3 W., from which they make common brick for

COUNTY, 1880-1927.

Mineral water		Salt, value	Miscel- lanous stone ¹ , value	Miscellaneous and unapportioned		
Gallons	Value			Amount	Value	Substance
10,000	\$2,400					
10,000	8,000					
54,000	18,000					
10,000	4,000					
20,000	4,000					
5,000	2,500					
8,000	4,000					
8,000	4,000					
550,000	55,000					
20,000	2,000	300				
5,000	500	300				
5,000	500	300				
5,000	500					
75	42		\$600			
100	100	200				
1,000	500			750	\$752	Chromite and salt.
²				11,076	3,575	Brick, granite, mineral water, natural gas.
				2,373		Other minerals.
				2,500	2,800	Other minerals.
				7,500	1,500	Unapportioned.
				²	26,400	Other animals.
				30,520	300	Brick and miscellaneous stone.
				²	9,388	Other minerals
				4,900	1,316	Brick and chromite.
				26,054	8,400	Brick and miscellaneous stone.
				²	77,183	Brick and chromite.
				2,100	8,240	Brick and miscellaneous stone.
				²	5,350	Brick and chromite.
² 701,175	\$102,042	² \$1,100	² \$88,373		\$145,204	

local use. Most of the work is done by hand; the brick press, however, is operated by the power of two horses. Nine men can produce 8000 bricks per day. They did not make any brick in 1927, and do not expect to make any in 1928, because of a stock on hand.

Deposits of clay which is of some value for filtering oils and deposits of diatomaceous earth occur in the county, but these are not being worked.

COPPER

The property formerly held by the *California and Massachusetts Copper Mines Company* in Sec. 25, T. 27 N., R. 9 W., on the north slope of Tom's Head Mountain, is now held by J. M. McCampbell and Mrs. P. O. Thomas of Red Bluff. It is described by W. B. Tucker in State Mineralogist's Report XV, who states that the ore is chalcopyrite associated with pyrite, and that it has a low copper content. Enough work is being done annually to hold seven claims.

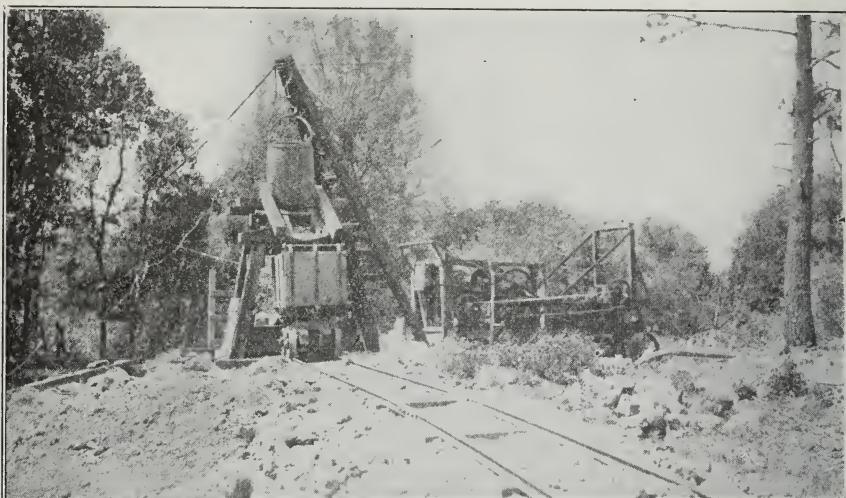
GOLD

Joe Arnol Prospect. Joe Arnol of Manton is sinking a prospect shaft for gold on Sec. 28, T. 30 N., R. 1 E., one mile south of Manton. He states that he drilled a six-inch hole which penetrated the basaltic lava at a depth of 32 feet and entered gravel which continued to a depth of 50 feet. A sample of this gravel, which he sent to a San Francisco

assayer, was said to contain \$13.50 per ton in gold. At the time of the visit to this prospect the shaft was down 30 feet in closely packed boulders of vesicular basaltic rock. A home-made well-drilling rig was being used as a hoist, as is shown in the photograph.

W. A. Fish of Red Bluff states that years ago some Chinese washed gold from the Sacramento River gravels near Jelley's Ferry by ground-sluicing. Later a dredger was built to work the deposit, but it was of faulty design and never operated. Nothing has since been done with the deposit.

Chas. M. Holbert and others of Beegum, recorded several lode locations in the Beegum district in 1926 and 1927, which they say contain gold.



Joe Arnol's Prospect near Manton, Tehama County.

MANGANESE

Several manganese prospects have been found associated with the belt of serpentine in the western portion of the county. One of these is in Sec. 20, T. 23 N., R. 7 W. No important production has been made from them, and they are now idle.

MINERAL SPRINGS

Morgan Springs are situated about 50 miles northeast of Red Bluff. Tucker¹ says "There is a group of 25 springs and pools scattered for a distance of $\frac{1}{4}$ mile in a meadow along Mill Creek; this meadow is termed Big Hot Spring Valley. Most of them are quiet pools of small flow, as a rule less than five feet in diameter and relatively shallow. A number of them contain thick algous growths, and several deposit native sulphur." These springs are now held in the name of the *Meadow Ranch Company*, care of R. W. Hanna of the Standard Oil Company, San Francisco. Mr. Hanna is reported to be improving them as a summer home.

¹ Tucker, W. Burling, Report XV of the State Mineralogist, p. 263.

Tuscan Springs are situated 10 miles northeast of Red Bluff, near the head of the cañon of Salt Creek. There are about 50 springs of water of different saline content. Some are rich in salts of potassium and sodium, some give off illuminating gas in usable quantities, and some are strongly sulphuretted as well as saline. There was at one time a large hotel at these springs and the place was popular as a health resort. The hotel and several buildings burned in 1917, and were never rebuilt. The place is now for sale by the estate of Martha Walbridge, of which W. A. Fish of Red Bluff is attorney.

GAS AND OIL

The *Tehama Oil Syndicate*, care of E. S. Bruce, 216 East First Street, Long Beach, is drilling a well with a water-well rig on Sec. 20, T. 24 N., R. 5 W. The driller, O. L. Wilder of Corning, reports a



Gas Well of Tehama Oil Syndicate in Sec. 20, T. 24 N.,
R. 5 W., at Flournoy, Tehama County.

strong flow of gas at a depth of 295 feet, and a gravel containing water at 300 feet. At the time of the visit to this well no flow of gas was evident, the reason given being that the water had come up to within a few feet of the surface, and had shut off the flow. Cuttings from the hole scattered around the well indicated that the upper part of the hole was in a hard blue clay and the lower part in a gravel composed of andesitic pebbles with very abundant fragments of white quartz. The photograph shows this well.

Other wells in this section which flow usable quantities of gas, and some of which flow artesian water in addition, are owned by Flournoy Union School, Flournoy, Sec. 20, T. 24 N., R. 5 W.; I. W. Brunk, Flournoy, Sec. 30, T. 24 N., R. 5 W.; R. J. Black, Red Bluff, Sec. 24, T. 25 N., R. 6 W.; J. J. Heavey, Flournoy, Sec. 16, T. 24 N., R. 5 W.

S. D. Furber¹ of Red Bluff has published a report which states that conditions are favorable in Tehama County for the discovery of petroleum. Mr. Furber has an interesting collection of mineral specimens and fossils obtained from Tehama and nearby counties.

SAN FRANCISCO FIELD DIVISION

C. McK. LAIZURE, Mining Engineer

On account of unfinished field work there is no report from the San Francisco Field Division in this issue.

LOS ANGELES FIELD DIVISION

W. BURLING TUCKER, Mining Engineer

On account of unfinished field work there is no report from the Los Angeles Field Division in this issue.

¹ S. D. Furber, Oil News, Vol. 1, No. 2, Sacramento.



OIL FIELD DEVELOPMENT OPERATIONS

By R. D. Bush, State Oil and Gas Supervisor

From April 1, 1928, to and including June 30, 1928, the following new wells were reported as ready to drill:

Company	Sec.	Twp.	Range	Well No.	Field	
COLUSA COUNTY:						
E. and G. Products Co.	2	14	5	1		
FRESNO COUNTY:						
California Northern Petroleum Co.	2	21	14	19	Coalinga	
Zier Oil Co.	1	20	14	28	Coalinga	
Zier Oil Co.	1	20	14	N-7	Coalinga	
Zier Oil Co.	1	20	14	N-8	Coalinga	
Zier Oil Co.	1	20	14	N-9	Coalinga	
HUMBOLDT COUNTY:						
Revert Mining Co.	6	3	1	1		
KERN COUNTY:						
H. J. Bardwell	24	28	20	Tillinghost 1	Belridge	
Berry Oil Co.	30	28	21	86	Belridge	
Berry Oil Co.	30	28	21	87	Belridge	
Berry Oil Co.	30	28	21	90	Belridge	
Berry Oil Co.	30	28	21	91	Belridge	
Hugh Porter	36	28	20	2	Belridge	
Hugh Porter	36	28	20	3	Belridge	
Standard Oil Co.	31	30	25	Kern Co. Lease No. 1		
	25	28	27	27	Elk Hills	
Betts Petroleum	20	28	28	Sturgeon 5	Kern River	
Boston Petroleum Co.	16	28	27	26	Kern River	
Brownmoor Oil Co.	16	28	27	Cauley 11	Kern River	
Brownmoor Oil Co.	16	28	27	Cauley 32	Kern River	
California Star Oil Co.	22	28	27	6-40	Kern River	
Clyde De Lano	34	28	28	1	Kern River	
Pan American Petroleum Co.	22	28	27	29	Kern River	
Petroleum Securities Co.	22	28	27	4-B	Kern River	
J. F. Harrison	20	30	22	7-A	McKittrick	
The Ohio Oil Co.	8	30	22	1	McKittrick	
C. C. M. O. Co.	8	32	23	84	Midway	
C. R. Craft	21	31	22	7	Midway	
Honolulu Consolidated Oil Co.	6	32	24	14	Midway	
Honolulu Consolidated Oil Co.	8	32	24	23	Midway	
Honolulu Consolidated Oil Co.	8	32	24	24	Midway	
North American Oil Cons.	2	32	23	13-A	Midway	
North American Oil Cons.	32	31	24	30	Midway	
North American Oil Cons.	30	31	24	45	Midway	
Republic Petroleum Co.	8	32	23	32	Midway	
Standard Oil Co.	19	31	24	83	Midway	
Standard Oil Co.	29	31	24	83	Midway	
Standard Oil Co.	29	31	24	84	Midway	
Standard Oil Co.	33	31	24	84	Midway	
Standard Oil Co.	33	31	24	85	Midway	
Standard Oil Co.	19	31	24	91	Midway	
Standard Oil Co.	1	32	23	218	Midway	
Standard Oil Co.	7	32	24	229	Midway	
Fred J. Elliott	20	27	28	1	Mt. Poso	
General Petroleum Corp.	21	27	28	Glide 21	12	Mt. Poso
General Petroleum Corp.	21	27	28	Glide 21	30	Mt. Poso
R. S. Lytle	26	27	28	1	Mt. Poso	
Alfred L. Marsten	34	27	28	1	Mt. Poso	
Modoc Petroleum Corp.	32	26	28	Kathryn-Hyde	3	Mt. Poso
Petroleum Securities Co.	21	27	28	Glide 1	Mt. Poso	
Petroleum Securities Co.	22	27	28	Reuch 6	Mt. Poso	
Shell Co.	7	27	28	Glide 1	Mt. Poso	
Shell Co.	1	27	27	Glide 4	Mt. Poso	
Signal Gasoline Co., Inc.	27	27	28	2	Mt. Poso	
The Texas Co.	15	27	28	Glide 2	2	Mt. Poso

OIL FIELD DEVELOPMENT OPERATIONS—Continued

Company	Sec.	Twp.	Range	Well No.	Field
KERN COUNTY—Continued					
The Texas Co.	15	27	28	Glide 2	Mt. Poso
Elbe Oil Land Development Co.	20	28	29	Freeman 1	Round Mountain
General Petroleum Corp.	30	28	29	Conry 5	Round Mountain
The Kern River Oil Fields of California, Ltd.	13	28	28	Kerneo 2	Round Mountain
Fred M. Sayre	10	28	28	Sayre-McNeil 1	Round Mountain
Shell Co.	4	28	28	Fuhrman 1	Round Mountain
Shell Co.	29	28	29	Jewett 3	Round Mountain
Lake View Oil and Refining Co.	4	11	23	Midway Fields 9	Sunset
Midway Northern Oil Co.	7	11	23		Sunset
Standard Oil Co.	31	12	23		Sunset
Exeter Oil Co.	1	29	20		225
Standard Oil Co.	28	11	20	Pray 2	Tremblor
California Petroleum Corp.	22	31	29	Kern Co. Lease 2	Wheeler Ridge
A. Bruce Frame	6	26	28	Pauley 1	
General Petroleum Corp.	35	25	25	Villard 1	
E. C. Johnson	33	25	27	Stiles 1	
Milham Exploration Co.	8	28	23	Jasmin 1	
Milham Exploration Co.	5	28	23	Hume 1	
North American Royalty Co.	8	28	25	Kern 5	
The Pacific Eastern Production Co.	6	30	28		3-KCL-A
Shell Co.	6	29	27		K. C. L. 1
Southern California Gas Co.	10	28	23		1
Superior Oil Co.	9	29	27		Ansolabehere 1
LOS ANGELES COUNTY:					
Union Oil Co.	33	3	13	Callender 24	Dominguez
Pacific National Co.	7	2	14		6
Standard Oil Co.	8	2	14	Baldwin-Cienega 39	Inglewood
Standard Oil Co.	17	2	14	Baldwin-Cienega 56	Inglewood
Standard Oil Co.	16	2	14	Baldwin-Cienega 64	Inglewood
Standard Oil Co.	16	2	14	Baldwin-Cienega 72	Inglewood
Standard Oil Co.	17	2	14	L.A. Invest. 1	Inglewood
Adams and Carrey	19	4	12		Long Beach
Bolsa Chica Oil Corp.	30	4	12	Combs 2	Long Beach
Bush-Voorhis Oil Co.	19	4	12		24
California Petroleum Corp.	30	4	12	Buell-Ryder 1	Long Beach
California Petroleum Corp.	19	4	12	Harlow 10	Long Beach
California Petroleum Corp.	19	4	12		Long Beach
California Petroleum Corp.	19	4	12	Harlow 11	Long Beach
California Petroleum Corp.	19	4	12	Moore 4	Long Beach
California Petroleum Corp.	30	4	12	Shilling 5	Long Beach
California Petroleum Corp.	20	4	12	Yochem 4	Long Beach
Cannon-Jones Oil Co.	29	4	12	Hall-Webber 1	Long Beach
F. W. Combs	30	4	12		9
Continental Oil Co.	24	4	13	Benio 1	Long Beach
Continental Oil Co.	19	4	12	Young 1	Long Beach
Dabney-Johnston Oil Corp.	24	4	13		11
Dabney-Johnston Oil Corp.	30	4	12		13
Dabney-Johnston Oil Corp.	29	4	12		14
Dabney-Johnston Oil Corp.	19	4	12		15
D'Angelo Oil Co.	19	4	12		3
General Petroleum Corp.	30	4	12	Clock 5	Long Beach
General Petroleum Corp.	30	4	12		Long Beach
General Petroleum Corp.	19	4	12	Jonah 6	Long Beach
General Petroleum Corp.	19	4	12	K. and H. 10	Long Beach
Graham-Loftus Oil Co.	19	4	12	Mission 3	Long Beach
Graham-Loftus Oil Co.	19	4	12	Daly 1	Long Beach
Hancock Oil Co.	29	4	12	Lightburn 4	Long Beach
Hancock Oil Co.	29	4	12	Signal 9	Long Beach
Hancock Oil Co.	19	4	12	Signal 10	Long Beach
Herndon Petroleum Corp.	28	4	12	Signal 11	Long Beach
Herndon Petroleum Corp.	29	4	12	Herndon 8	Long Beach
				Herndon 9	Long Beach

OIL FIELD DEVELOPMENT OPERATIONS—Continued

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Cont.					
George A. Langstaff	13	4	13	Bixby 1	Long Beach
Marine Corp.	19	4	12	63	Long Beach
McKeon Drilling Co., Inc.	29	4	12	Macrate 2	Long Beach
W. F. Meyer	19	4	12	2	Long Beach
Miley Oil Co.	19	4	12	Mills 8	Long Beach
Pan American Petroleum Co.	29	4	12	Anderson 4	Long Beach
Richfield Oil Co.	19	4	12	Bernstein 3	Long Beach
Richfield Oil Co.	29	4	12	Booth 11	Long Beach
Richfield Oil Co.	29	4	12	Britsch 2	Long Beach
Richfield Oil Co.	28	4	12	Connett 2	Long Beach
Richfield Oil Co.	29	4	12	Denni 8	Long Beach
Richfield Oil Co.	30	4	12	Ella 2	Long Beach
Richfield Oil Co.	29	4	12	Freeman 5	Long Beach
Richfield Oil Co.	30	4	12	Hass 18	Long Beach
Richfield Oil Co.	19	4	12	Meader 1	Long Beach
Richfield Oil Co.	19	4	12	R. C. 9	Long Beach
Richfield Oil Co.	20	4	12	Roco 1-A	Long Beach
Rio Grande Oil Co.	28	4	12	B-8	Long Beach
Rio Grande Oil Co.	28	4	12	B-9	Long Beach
J. Orville Seeple	19	4	12	Seeple 2	Long Beach
Shell Co.	29	4	12	Alamitos 33	Long Beach
Shell Co.	29	4	12	Alamitos 34	Long Beach
Shell Co.	29	4	12	Andrews 7	Long Beach
Shell Co.	29	4	12	Babb and Tucker 4	Long Beach
Shell Co.	29	4	12	Cherry Hill Comm. 7	Long Beach
Shell Co.	19	4	12	Cresson Comm. 12	Long Beach
Shell Co.	29	4	12	Dobyns 6	Long Beach
Shell Co.	29	4	12	Goddard 6	Long Beach
Shell Co.	29	4	12	Hutton Comm. 8	Long Beach
Shell Co.	29	4	12	Hutton Comm. 9	Long Beach
Shell Co.	29	4	12	Jones Comm. 9	Long Beach
Shell Co.	29	4	12	Kent-Garth 5	Long Beach
Shell Co.	29	4	12	Martin Comm. 5	Long Beach
Shell Co.	29	4	12	Nesa 8	Long Beach
Shell Co.	29	4	12	Nesa 9	Long Beach
Shell Co.	29	4	12	Shell Fee Land 4	Long Beach
Sheel Co.	29	4	12	Stakemiller 5	Long Beach
Sheel Co.	29	4	12	Stratton 3	Long Beach
Charles A. Son	19	4	12	Son-Yellow- stone 1-A	Long Beach
Sovereign Oil Corp.	19	4	12	2	Long Beach
Sovereign Oil Corp.	19	4	12	3	Long Beach
Sovereign Oil Corp.	20	4	12	4	Long Beach
The Texas Co.	19	4	12	Foster One 4	Long Beach
The Texas Co.	29	4	12	Goddard 2	Long Beach
The Texas Co.	19	4	12	Harlow 5-A	Long Beach
The Texas Co.	29	4	12	McDavid 4	Long Beach
The Texas Co.	29	4	12	Perrin 2	Long Beach
Turner-Harris Oil Corp.	29	4	12	2	Long Beach
Union Oil Co.	30	4	12	Long Beach Comm. 21	Long Beach
Union Oil Co.	30	4	12	Long Beach Comm. 22	Long Beach
Universal Consolidated Oil Co.	28	4	12	French 1	Long Beach
Universal Consolidated Oil Co.	28	4	12	Judson 2	Long Beach
Western Oil and Refining Co. and Olympic Refining Co.	19	4	12	14	Long Beach
Woolner Oil Corp.	19	4	12	Signal Hill 4	Long Beach
Standard Oil Co.	3	2	12	Whitehead Comm. 2	Montebello
Associated Oil Co.	34	2	14	Pacific Southwest 1	Potrero

OIL FIELD DEVELOPMENT OPERATIONS—Continued

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Cont.					
Associated Oil Co.	35	2	14	Voorhes 1	Potrero
Union Oil Co.	17	3	13	Chandler 3	Rosecrans
The Texas Co.	6	3	11	Matern Two 7	Sante Fe Springs
Union Oil Co.	6	3	11	Bell 28	Santa Fe Springs
Marland Oil Co.	11	5	12	Bixby 21	Seal Beach
W. W. Bush	16	4	14	2	Torrance
C. C. M. O. Co.	10	4	14	Torrance 92	Torrance
Russell Oil Co.	25	3	17	2	Torrance
Shell Co.	4	2	15	Mission 2	
World Petroleum Corp.	23	3	12	Bellflower 11	
MADERA COUNTY:					
Los Angeles-Madera County Syn. (Rex B. Goodeell, Trustee)	21	10	17	M. and L. 2	
NAPA COUNTY:					
Northern California Petroleum Co.	12	4	5	1	
ORANGE COUNTY:					
Brea Canon Oil Co.	2	3	10	44	Brea Olinda
Shell Co.	2	3	10	Orange 17	Brea Olinda
Union Oil Co.	2	3	10	Naranjal 13	Brea Olinda
Petroleum Securities Co.	24	3	11	McNally 1	Coyote Hills
Standard Oil Co.	13	3	11	Emery 41	Coyote Hills
Standard Oil Co.	24	3	11	Emery 42	Coyote Hills
Bell of Montebello Oil Co.	2	6	11	8	Huntington Beach
Commonwealth Oil Co.	11	6	11	3	Huntington Beach
Garliepp and Mack	11	6	11	3	Huntington Beach
Sam N. Lewis	10	6	11	Van 1	Huntington Beach
W. D. McCoy	11	6	11	1	Huntington Beach
Standard Oil Co.	34	5	11	Bolsa 36	Huntington Beach
Standard Oil Co.	34	5	11	Bolsa 37	Huntington Beach
Standard Oil Co.	34	5	11	Bolsa 38	Huntington Beach
Standard Oil Co.	10	6	11	P. E. 16	Huntington Beach
Continental Oil Co.	33	3	9	Pyne 7	Richfield
George W. Johnson	28	3	9	Davenport Comm. 1	Richfield
Nugent Drilling Co.	27	3	9	3	Richfield
Union Oil Co.	33	3	9	Stern 13	Richfield
C. R. McCollom and W. H. Taylor	13	5	11	Sterling Price 1	
RIVERSIDE COUNTY:					
Hall, Holtz and Hennessy, Trustees	23	7	3	Watt 1	
SAN BENITO COUNTY:					
Associates Petroleum Corp.	5	19	10	2	
J. H. Hadley, Jr.	5	17	12	1	
SAN DIEGO COUNTY:					
James H. Bach	8	15	3	1	
SAN LUIS OBISPO COUNTY:					
Union Oil Co.	12	32	14	Huasna- Chandler 1	
SAN MATEO COUNTY:					
Shell Co.	8	6	5	Cowell 2	
Skyline Oil and Refining Corp.	15	6	5	1	
SANTA BARBARA COUNTY:					
Palmer Union Oil Co.	30	9	32	Stendel 10	Cat Canyon
Palmer Union Oil Co.	30	9	32	Stendel 20	Cat Canyon
Barnsdall Oil Co.	--	4	29	Luton-Bell 1	
SANTA CLARA COUNTY:					
Continental Oil Co.	1	12	3	3	Sargent
SOLANO COUNTY:					
H. Rambke	18	7	1	1	

OIL FIELD DEVELOPMENT OPERATIONS—Continued

Company	Sec.	Twp.	Range	Well No.	Field
VENTURA COUNTY:					
Continental Oil Co.	21	4	22	Fox 1-M	Ojai
Continental Oil Co.	22	4	22	Thompson 1-M	Ojai
Bankline Oil Co.	7	3	24	1	Rincon
C. C. M. O. Co.	17	3	24	Hobson B-3	Rincon
Elmer Co.	6	3	24	Elmer 3	Rincon
General Petroleum Co.	7	3	24	Oland 1	Rincon
General Petroleum Co.	8	3	24	Tomson 2	Rincon
General Petroleum Co.	8	3	24	Tomson 4	Rincon
Italo Petroleum Corp.	7	3	24	Hickey 1	Rincon
Petroleum Exploration Co.	7	3	24	Hickey 1	Rincon
Southern Pacific Land Co.	8	3	24	4	Rincon
Southern Pacific Land Co.	8	3	24	5	Rincon
Wilshire Oil Co., Inc.	7	3	24	Hickey 1	Rincon
Wasibi Oil Co.	34	5	19	B	Sespe
Oak Ridge Oil Co.	18	3	20	Willard 24	South Mountain
Associated Oil Co.	22	3	23	Hartman 12	Ventura
Associated Oil Co.	22	3	23	Lloyd 36	Ventura
Associated Oil Co.	27	3	23	Lloyd 56	Ventura
Petroleum Securities Co.	28	3	23	Orton 8	Ventura
Petroleum Securities Co.	28	3	23	Orton 9	Ventura
Petroleum Securities Co.	28	3	23	Orton 10	Ventura
Shell Co.	28	3	23	Edison 24	Ventura
Shell Co.	28	3	23	Edison 25	Ventura
Sheil Co.	28	3	23	Gosnell 27	Ventura
Shell Co.	28	3	23	Gosnell 28	Ventura
Shell Co.	29	3	23	Taylor 23	Ventura
Shell Co.	28	3	23	Taylor 27	Ventura
Shell Co.	27	2	22	Grubb 1	
Shell Co.	22	2	22	Lambert 1	
Shell Co.	27	2	22	Snodgrass 1	
Standard Oil Co.	15	2	22	Saticoy-	
				Citrus 4	
Standard Oil Co.	10	2	22	Schneider 1	
Standard Oil Co.	11	2	22	Vanoni 1	

SPECIAL ARTICLES

Detailed technical reports on special subjects, the result of research work or extended field investigations, will continue to be issued as separate bulletins by the Bureau, as has been the custom in the past.

Shorter and less elaborate technical papers and articles by members of the staff and others are published in each number of *MINING IN CALIFORNIA*.

These special articles cover a wide range of subjects both of historical and current interest; descriptions of new processes, or metallurgical and industrial plants, new mineral occurrences, and interesting geological formations, as well as articles intended to supply practical and timely information on the problems of the prospector and miner, such as the text of new laws and official regulations and notices affecting the mineral industry.

QUARTZ CRYSTALS

The following information regarding quartz for use of the United States Navy has been supplied by the Naval Research Laboratory, Bellevue, Anacostia, D. C.

Naval headquarters in San Francisco is at 100 Harrison Street; Captain McDowell in charge, to whom samples may be submitted.

The U. S. Navy needs tons of quartz crystals and will pay \$6,000 per ton f.o.b. San Francisco for suitable crystals.

The Naval Research Laboratory, Anacostia, D. C., will be glad to examine and report on sample crystals sent there for inspection. Quartz crystals must comply with certain requirements regarding weight and quality; otherwise they are useless. Careful reading of the requirements outlined below may save useless trouble and correspondence.

(a) Crystals must be clear. In other words, you should be able to look through them the same as you can a piece of good plate glass and not notice any imperfections therein.

(b) Crystals must be single crystals and must weigh at least 2 pounds each. Two to thirty pounds is the preferable size desired, although larger crystals will be accepted. Growth lines must be in evidence on at least 2 side faces.

(c) Imperfections that make quartz useless are (1) fractures, which look like internal cracks in the crystal, and (2) inclusions of foreign substances. The latter generally exhibits itself by making the crystal opaque or milky rather than clear, and the microscope shows this is due to minute bubbles of some included substance such as air or water. This defect often shows itself in the form of fleecy clouds.

As a matter of general information it might be mentioned a quartz crystal is parallel-sided with 6 faces topped by a 6-sided apex and consists of one crystal ONLY, not several small crystals grown together in a lump. On these side faces are usually found growth lines, small ridges perpendicular to the edges. Occasional fractures are to be expected and would not cause rejection of crystal unless present in considerable numbers. Fractures result from injury to the crystal at some time subsequent to its formation either by earth movements or other causes, while inclusions of foreign substances occur at the time the crystal is being formed. Perfect crystals are not required; fragments of suitable size and quality showing at least parts of 2 natural side faces with growth lines thereon are entirely satisfactory.

There are two other kinds of quartz crystals which the Navy can use. One of these is known as smoky quartz, as this results from an uniform color throughout the quartz and is not caused by inclusions previously mentioned. The only restriction regarding smoky quartz is that the color can not be so dense as to prohibit visual inspection for fractures or inclusions by use of a strong light. The other kind of quartz is known as limpid quartz. This generally consists of big fragments of clear glass-like quartz without any natural faces. Its use necessitates considerable work to determine the optical axis, hence its value is less than that of crystal quartz.

Quartz is used for controlling the frequency of radio transmitters and therefore has a military significance. The main source of crystal supply at present is Brazil, but it is believed that domestic sources exist if they can be found and developed. It is further believed that except for occasional crystals of the required size the probable location in this country of crystal deposits of sufficient size to be of value will be found in the Mother Lode in California and in northern Nevada. Crystals of the required characteristics have been obtained in Calaveras County, California.

In using these crystals the Navy avails itself of the growth lines as an indication of the direction in which the optical axis lies. This is generally along the length of the crystal. Crystals are then cut up into slabs about 1" thick perpendicular to the axis. After optical examination the slabs are cut into strips anywhere from 3/100 to 2/10 inches thick, which are further cut up into pieces about 1" long, so that the final product is a small slab of perfect quartz about 1" square by say 1/10 inch thick. There can not be the slightest imperfection in this final piece; hence the crystal must be nearly clear and perfect if it is to be divided up into such small units and have them be of any value.

The Navy specifications require Brazilian quartz shall be clear and free from fractures. To develop a domestic source of supply the Navy is willing to pay a differential over the cost of Brazilian quartz and to make the further allowance that crystals, in large part clear but partly defective at one end, will be accepted and paid for on the basis of approximate weight of suitable part. In doing this the Navy incurs the expense of paying freight on and cutting out the unsuitable material. As it is also necessary that the crystal be free from twinning and this can only be ascertained by optical examination after the crystal has been sawed up. The Navy assumes the further risk of finding crystals otherwise acceptable entirely unsatisfactory when the optical examination is made.



NOTES ON THE LAW OF MINING LOCATIONS AND LANDS OPEN TO MINING IN CALIFORNIA¹

By C. A. LOGAN

One of the most frequent subjects of inquiry at the offices of this Bureau is the matter of mining law, as applied to the proper procedure for locating claims and holding same. The State Mining Bureau has published various bulletins on the subject, but stock of these is at present exhausted. The following notes are intended to make available for reference the main points of federal and state laws prescribing the methods to be followed in taking up mining claims on vacant public lands within this state, with some notes on lands available for mining.

These notes are based in the main upon those parts of the statutes which are of direct interest to the prospector who wants to make his location legal, and the writer has tried to avoid any technical or theoretical considerations not directly touching upon these details. Therefore no mention is made of the extralateral right nor of the other legal sinuosities that may arise. At the same time, it is believed that if the simple points mentioned are carefully attended to in making out the location notice and laying out the claim, the locator will avoid most of the dangers and vexations that later befall him when his location is faulty. The subject of mining law is a complex one, of such scope as to call for extended study by anyone who would master it. For a complete reference book on the subject the reader should consult Lindley² or one of the other standard authorities. An excellent reference book, much smaller but covering practical points, is Wilson's *Mining Laws*; also Ricketts' *'Manual of American Mining Law.'*

In preparing the following notes the writer has drawn freely upon lecture notes taken while attending a course of lectures delivered at the University of California by William Colby, mining attorney, to whom acknowledgment is here made. Lindley on Mines has also been used, as have numerous federal and state circulars dealing with the details concerned. Cases could be cited for most of the points covered.

Summarizing the requirements of the United States and California statutes, as applied to lode mining locations upon vacant government land within this state, it will be noted that the following indispensable requirements must be met in order to fully protect the interests of the claimant:

(1) Discovery, the most vital factor, which must precede location or any rights thereunder. (Federal and state requirement.)

(2) The location must be marked upon the ground so that the boundaries of the claim or claims can be readily traced by anyone coming on the property and desiring to know what land is claimed. (Federal and state requirement.)

¹ Reprinted from the July chapter of Report XX, 1924 (out of print), on account of the continued request for information on this subject.

² Lindley on Mines. A treatise on the American law relating to mines and mineral land, by Curtis H. Lindley, San Francisco, 1914.

(3) Where the state or district mining law requires that a record of the location be kept, the federal statute requires that this record must contain the following details:

1. The name of the lode or claim.
2. The name of the locator or locators.

3. The number of linear feet claimed in length along the course of the vein, each way from the point of discovery, with the width on each side of the center of the claim, and the general course of the vein or lode, as near as may be.

4. The date of location.

5. Such a description of the claim by reference to some natural object, or permanent monument, as will identify the claim located.

The state law incorporates these provisions of the federal statute, word for word.

(4) The state law (see paragraph 1426, *post*) specifies that a location notice must be posted upon the claim at the point where the discovery of valuable mineral is made, and that this notice must contain the information called for under the five divisions of the last paragraph.

(5) The state law also requires that a copy of the above notice must be filed for record within 30 days of the date of posting, in the office of the county recorder of the county in which the claim is situated.

Differing from the lode location requirements, the state laws regarding placer claims specify that where placer claims are taken by location according to the subdivisions of the public land survey and where the location notice specifies the legal subdivision of section, township and range, the boundaries of a claim so located and described need not be staked nor monumented. A prudent locator will, however, always stake his claim and when describing the same as above mentioned will ordinarily need at least an approximate survey to be sure the notice properly describes the land intended to be claimed.

Importance of Discovery in Initiating the Locator's Rights

Upon a lode claim, discovery is defined as the actual finding of *ore in place*, not as float. The value of the ore is not a controlling factor, but the test is, according to Colby,¹ "would a prudent man be justified in spending money to develop it?" (See *Brook vs. Justice Mining Co.* 58 Fed., p. 120.)

While it has been remarked that the order in which the various steps required to complete a valid location is not necessarily invariable, it may be said in general that the claim is not safely secured against rival locators until a valid discovery of mineral has been made. Court decisions on the point have been at variance. In this state the first locator may get an injunction forbidding the second from coming upon the claim, pending decision of the matter. This would apparently give the first locator an advantage in the "race of diligence" to reach the mineral first. Prior possession is an important factor.

Where there is a contested area claimed by two or more locators, the senior locator might make a valid discovery of mineral in the contested area, but the junior locator or locators could not ordinarily

¹ W. E. Colby, attorney at law and lecturer on Mining Law, University of California.

do so, unless the senior locator so far forgot his own interests as to fail to take proper steps to prevent it. This point arose in a recent case decided by the local land office.

Neither the federal law nor the California statutes require that any particular form of opening or any certain amount of work be done to complete a valid discovery.

Marking the Claim, and the Shape of Claim

The state law does not specify any particular manner of marking claim boundaries. The U. S. General Land Office regulations specify a post or stone monument at each corner and a post, stake or board at the discovery point. While it is not absolutely necessary that such markers be maintained by the locator, it of course is advisable to keep such markers in place both for his own protection and as a matter of justice to other prospectors who may be seeking minerals in the same locality.

The ideal quartz mining claim, which will give the largest area allowed by the federal statute and the fullest exercise of the extralateral right, is 1500 feet long by 600 feet wide, and is a right-angled parallelogram with the side lines parallel to the lode and the end lines crossing the lode at right angles. The claim can not extend more than 300 feet on each side of the center of the vein, measured at right angles to the side lines. The end lines must be parallel straight lines, but the side lines need not be either parallel or straight, and if the vein is sinuous, the side lines should follow it. Care should be exercised to see that the claim is so taken that the vein does not depart from the claim through a side line, as this would result in greatly cutting down the length of the claim and would curtail the exercise of the extralateral right, possibly with very serious loss to the locator. The law will give the locator only so much of the vein along the strike as he has of the apex within the boundaries of his claim. The end lines do not have to be of equal length and do not have to cross the vein at any particular angle. The possession of the apex within the boundaries of the claim is essential to the enjoyment of the extralateral right downward on the dip of the vein.

Form of Location Notice. Posting the Notice

Neither the Federal nor the California statutes require any particular *form* that need be followed in writing the location notice, and it is not necessary to use any particular printed blank, although the blank is convenient and often safer as its use insures that attention will be called to the information required, preventing the omission of some important detail. Suggested forms that may be used as models in writing out either lode or placer location notices are shown herewith.

The courts as a rule have been liberal in dealing with the question of form of location notices, and as a rule inquire rather into the good faith of the locator than into the form of his notice. The notice must contain the details given under the five headings of paragraph 3 under requirements. The signatures of witnesses on the location notice naturally strengthen it in case of dispute, although not specifically required in California, and if it happened that two or more rival locations were attempted upon the same claim on the same day, it

would prove of value to show the hour of the posting. If the position of the claim with regard to section, township and range is known this should be shown. The old mining districts with their district recorders have become extinct, with possibly one exception, in this state.

The location notice must be posted at a conspicuous place on the claim, as it is intended to be a notice to all the world that the ground claimed has been removed from the public domain for mining purposes. It will be noted that the state law regarding placer locations says the location notice may be posted upon a tree, rock in place, stone, post or monument, and does not specifically mention that it is to be put at the point of discovery. As a matter of prudence, but not specifically required by law, the location notice should be maintained upon the claim. The test of the sufficiency of a location notice would be to take the notice as posted and recorded, and in the absence of stakes or lines, trace out the boundaries of the claim from the recorded description.

Assessment Work. Proof of Labor. Delinquent Colocator

The annual assessment year now begins at noon, July first. The locator of a claim has one full year, beginning at noon of July first, next following the date of his location, during which to perform the first year's assessment work. One hundred dollars worth of labor must be done or improvements made upon each claim per annum. The test of the validity of assessment work done is: Does it facilitate the extraction of valuable mineral from the claim?

Three classes of work may be valid as assessment work or for credit toward the \$500 requirement for patent. (1) Work within the boundaries of the claim for the purpose of actually developing the mineral deposits in the claim. This may consist of excavation, drilling, erection of works *for mining* or placing of machinery for use *in mining*, the development of orebodies, or the actual extraction of mineral. A quartz mill does not satisfy the assessment requirement on a lode claim, but a dredger does on a placer claim. (2) Work on a group of claims for the joint benefit of all, by virtue of the community of interest between colocators or an agreement between locators of adjoining claims. (3) Work outside of a claim or group of claims, when such work tends to facilitate the extraction of valuable mineral from the claim or claims. This includes tunnels for the development of deposits above the line of tunnel; roads and trails, and the making of flumes and ditches to conduct water to placer mining claims.

As regards requirements of assessment work, an association placer, taken up as a unit by colocators, may be considered as a single claim, though containing more than 20 acres. All the assessment work for a group of adjoining claims may be done upon one claim if conclusively shown to benefit the entire group, and if \$100 is expended for each claim. The term "group of claims" as here used, is applied to a number of claims taken up by colocators and regarding which it was understood at the time of location that they were being so taken.

The proof of labor is an affidavit made by the owner of the claim or by some one in his behalf, acquainted with the facts, setting forth that during the year in question, certain amounts (not less than \$100 for each claim) have been expended for labor upon or for improvements upon the claim named. This affidavit must be filed for record

in the office of the county recorder of the county in which the claim or claims are situated, within 30 days after July first each year (except as before mentioned for the fraction of a year between the date of location and the next July first.)

The California statute (see paragraph 1426*s* herewith) provides that the failure or neglect of any locator of a mining claim to perform assessment work as specified in the United States statutes shall disqualify such locator from relocating such claim or any part thereof within three years of the date of his original location, and any such attempted relocation is declared void. To prevent location of such a claim by others, such a delinquent locator would have to go upon the claim and prosecute his work to completion.

The United States statutes (section 2324 herewith) provide the general manner in which one locator of a claim who keeps up the assessment work on the claim may obtain relief from his fellow locators who fail to pay their shares of such expense. The California statute (paragraph 1426*o* herewith) sets forth in detail the procedure to be followed in serving or publishing the notice to the delinquent party, and the steps the delinquent may take to protect his interests within the 90-day period allowed him. Failure of such delinquent coowner to meet his share of the cost of assessment work within 90 days after personal service of notice, or within 90 days after the beginning of weekly publication of such notice of delinquency in the newspaper published nearest the claim, results in the delinquent's interest in the claim becoming the property of the owner or coowners who have paid for the assessment work.

Extent of the Right to Locate Claims and Those Eligible to Make Locations

Neither the United States nor California mining laws limit the number of lode or placer claims that may be located by one person. An individual may locate as many claims for mining as he is able to find separate valid discoveries of mineral for, the law requiring that such a discovery be made for each claim within the boundaries of the claim.

A single locator may not locate more than 20 acres of placer mining ground in one "claim," but an association of locators may take up an association placer, containing not more than 20 acres for each locator, and not more than 160 acres in a single such association "claim" by a minimum of eight persons.

Women and minor children have equal rights with others in locating mining claims.

What May Be Located as Mineral

It seems strange that dispute should arise as to whether or not a substance is mineral. Yet it is of recent record that the question of the mineral character has been raised in the case of such an important mineral as petroleum, by parties who were interested in having oil lands declared nonmineral. Besides the metals, which are minerals beyond dispute, the following substances have been held to be mineral, according to the decision of the United States Land Office and the courts: Alum, amber, asphaltum (see petroleum), borax, brick clay, building stone, carbonates (of soda, etc.), cement (gypsum), china clay, high-grade pottery clay, etc.; coal (special laws govern), diamonds and other precious stones, gravel, guano, gypsum, kaolin, limestone, marble,

mica, natural gas (see petroleum), nitrates, onyx, petroleum (special withdrawals), potash (special legislation), phosphates (special legislation), salt (special law), sand, sandstone, slate, soda (nitrate and carbonate), stone of special commercial value, sulphur and umber.

There is sometimes question as to whether or not a certain deposit should be located as placer or lode. In such a case and in the absence of sufficient technical knowledge or lack of advice, there is nothing to prevent the location both as lode and placer, pending final determination of the character of deposit. In locating placer mining ground in which lodes occur, special attention should be paid to the provisions of law governing such cases. The Revised Statutes of the United States, title 32, chapter 6, section 2333, cover this point. It is provided that lodes known to exist within a placer claim for which patent is being sought must be described and separately purchased, and if the placer claimant, knowing of the presence of such lodes, fails to mention them in his application for placer patent, his failure to so do shall be construed as a declaration that he has no right of possession of such lodes. Quartz claims with a width of fifty feet may be taken up on *known* quartz veins within the boundaries of placer claims, but the complications that are apt to arise when a second party attempts to make such a location against the wishes of a hostile placer claimant, on whose claim he must trespass to make the lode location, are such as to call for the exercise of care. When a lode exists in a placer claim, but has not been discovered previous to the issuance of placer patent, the placer patent includes the lode or lodes that may be later discovered.

LANDS OPEN TO LOCATION FOR MINING

Title 32, chapter 6, section 2319, Revised Statutes of the United States, provides that all valuable mineral deposits in lands belonging to the United States, both surveyed and unsurveyed, are declared to be free and open to exploration and purchase, and the lands in which they are found to occupation and purchase, by citizens of the United States, and those who have declared their intention to become such. During recent years there have been many withdrawals of mineral lands and much special legislation regarding deposits of certain minerals. In fact there has been such a tendency ever since 1866, when a bill was presented in congress providing for the leasing of western mining lands on royalty. This was defeated by the western mining interests who substituted the mining law of 1866, which was later superseded by the enactment of 1872.

Under present conditions, lands known to contain coal, petroleum, oil shale, potash, phosphate, sodium salts (except common salt, on which one claim only may be located (can not be located and patented under the regular lode or placer laws but are obtainable under lease, subject to the control of the Secretary of the Interior. Land in certain national parks and national monuments is also not subject to entry. There have also been certain withdrawals of public lands for powersite and kindred use, with a Federal Power Commission exercising certain powers of disposal, and with entries for other purposes not allowed. The status of these powersite withdrawals, as affecting the miner's rights, is somewhat uncertain, and whether or not he could success-

fully prosecute a claim to land taken up under the mining law within such power reserves is debatable, as the United States Land Office regulations seem to imply some leeway, depending on circumstances in each case. Certain Indian reservations in the western states, including a few in California, which have heretofore not been open to exploration for mining, have been thrown open for prospecting in the last few years, and rules and regulations have been set up under which such reservation lands may be mined. These rules are rather onerous, and would deter the ordinary small prospector. Among the requirements for working such lands is one calling for a bond to be executed in favor of the government for \$500 or more on each lease, depending on acreage, and the payment of annual rental of 25 cents and upward per acre, as well as payment of royalty on any ores or minerals sold. This reservation land can be mined only for metalliferous minerals. Claims are to be taken up according to the United States mining laws, and annual assessment work has to be done in addition to having a survey made and fulfilling all the other terms mentioned. Information regarding mining such Indian reservation lands can be had from the several superintendents of the reservations. The leases are issued by the Secretary of the Interior, through the local superintendents.

Vacant government land within the numerous national forests of this state is open to location and patent for mining purposes to the same extent as other vacant unreserved government land. The total area of the national forests in California is about 19,000,000 acres and the lands included lie for the most part in the mountainous eastern part of the state, away from the settled portions and in general above an elevation of 2500 feet. Maps of the different forests may be obtained from the various local offices of the United States Forest Service or from their office in the Ferry Building, San Francisco. There is, of course, a great deal of patented land within the boundaries of these forests, which was patented before the forest reserve was set aside, and the local forest service employees should be consulted about such lands if in doubt.

The total acreage of unappropriated, unreserved government land in California on July 1, 1927, was 20,610,877 acres. The figures are from circulars of the General Land Office. The United States government maintains local land offices at Sacramento and Los Angeles, where information can be had regarding vacant government lands or steps taken to make entry for patent.

Mention should also be made here of the land included in stock-raising homesteads, patented under the act of December 29, 1916. Under the provisions of this act the Secretary of the Interior was authorized to designate unreserved public lands in the public-land states, of which California is one, as stock-raising lands. This does not refer to lands within the national forests. Under the terms of section 9 of this act, it is provided that all patents issued thereunder "shall contain a reservation to the United States of all coal and other minerals in the lands so entered and patented, together with the right to prospect for, mine and remove the same"; the same section also provides that any person qualified to locate and enter the coal or other mineral deposits, or having the right to mine and remove the same under the laws of the United States, shall have the right at all times to enter upon the lands entered or patented under the act for the

purpose of prospecting for the coal or other mineral therein. But he shall not injure or damage or destroy the permanent improvements of the entryman or patentee and shall be liable to and shall compensate the entryman or patentee for all damages to the crops on the land by reason of such prospecting. The prospector is required to do one of three things: (1) he must obtain the written consent or waiver of the homestead entryman or patentee; (2) he must pay damages to crops or other tangible improvements if and when an agreement is reached as to the amount of such damages; or, (3) in lieu of either of the foregoing provisions, he must execute a good and sufficient bond for not less than \$1,000 in favor of the United States for the use and benefit of the homesteader, to secure the payment of such damages. Subject to these provisions, he may occupy as much of the surface of such a homestead as may be reasonably necessary for the mining and removal of the mineral deposits within his mining claims. Where the mining location was made prior to the entry for homestead, the mining claimant must exercise diligence in filing a protest in the local land office of the district in which his claim is, setting forth the facts regarding his mining claim and the mineral character of the land, otherwise he is apt to awake too late to the fact that his claim has been given to the homesteader.

This act has been the cause of considerable complaint, and appears in some particulars to contradict itself. While it expressly reserves the mineral resources in such lands and affirms the right of qualified persons to enter the land for the purpose of prospecting for and mining mineral deposits, it also sets up restrictions which tend to discourage the prospector and which are discriminatory in favor of the homesteader.

Before passing from the subject of vacant public lands and the rights of the prospector thereon, it can not be too forcibly emphasized that, having once located a mining claim with the intention of holding and working the same, the only safe course for the locator to follow is to complete in the shortest possible time the \$500 worth of labor or improvements required for patent, to have the necessary survey made, and to press his application for patent with all diligence. Under the present laws, the miner has no means of making his claim known officially to the United States Land Office until he has completed the above work and has sought a patent, or until adverse claimants make it necessary for him to file a protest. If he spends only part of the year in the district where his claims are, it may happen that the published notice of application for patent by adverse claimants may escape his attention, and patent may be given to the adverse claimant for the land within his mining location, in spite of the fact that he may have fulfilled all the requirements of law to hold his claim and may be actually developing the claim at the time. This state of affairs is possible because of the failure of the United States Land Office to examine the character of lands for which patent is sought unless a protest is made.

STATE LANDS OPEN TO MINING

Besides the vacant government lands, there are within the State of California about 750,000 acres of land belonging to the state. This

consists chiefly of sections numbered 16 and 36, thus far unsold, in each township, except where exchanges have been made or are in course of being made, with the federal government for administrative reasons. Much of this land, like the vacant government lands, is either mountainous or desert land having little value as a rule for agriculture but with mineral possibilities in many cases. The counties containing large acreages of this state land are as follows: San Bernardino, about 250,000 acres; Inyo, about 150,000 acres; Riverside, 50,000 acres; Lassen, about 60,000 acres; Modoc, about 30,000 acres; Imperial, 30,000 acres, with lesser amounts in other counties, there being some of this land in about forty counties. This land is sold subject to a reservation of one-sixteenth of all minerals ever found therein to the state. Unsold state lands may be prospected, and may be leased for mining purposes, under regulations prescribed by the State Surveyor General, Capitol Building, Sacramento, and requests for information regarding the location of such lands and regulations governing the sale or lease of same should be addressed to him.

The records and reports of the State Mining Bureau, as well as the various government reports on file in the offices of the Bureau, may be referred to for information about the geology and mineral resources of the entire state, and these records will often be found useful in giving the prospector a general idea of the character and mineral possibilities of the district where he intends to search for minerals.

OTHER LAWS AFFECTING THE MINING LOCATOR

Hydraulic Mining

Placer mining by the hydraulic process on streams which drain into any tributary of a navigable river in this state must be carried on under regulations laid down by the California Debris Commission, made up of three officers of the Corps of Engineers, United States Army. For information regarding steps to be taken in order to obtain written permission for hydraulic mining on the watersheds of the navigable rivers, inquiries should be addressed to California Debris Commission, 85 Second street, San Francisco. The above restrictions do not apply on the Trinity, Klamath, Salmon, Smith or other rivers of the northern part of the state which are not navigable, but do cover work on any tributary of the Sacramento or San Joaquin or Feather rivers, which means all that part of the state whose streams flow into the great central valley.

Safety Regulations

The Industrial Accident Commission of California is charged with the framing and enforcement of safety orders and rules for the protection of mine workers, and inquiries on any phase of this subject should be addressed to the commission at the State Building, Civic Center, San Francisco.

Use of Water for Mining

The miner often wishes to use water that flows through or near by his claims. While the riparian right will permit the use by such an owner of water flowing through the claim where it is used, it is necessary to file an appropriation when desiring to make use of water where

the diversion point is outside of the claim. For the formalities to be observed in making an appropriation, the inquirer should address State Division of Water Rights, Department of Public Works, Sacramento. Water must be put to beneficial use as soon as possible, to hold it.

Use of Timber on Unpatented Mining Claims

The law permits a locator to use for mining or other necessities *on the claim or claims concerned*, any timber growing thereon, but such timber can not be cut down and taken off the claim for other uses.

Use of Mining Claims for Other Purposes

A mining claim can not be located as such and then used for other purposes such as a site for a store or summer resort, and such an attempted use would invalidate the location.



UNITED STATES MINING STATUTES

Title XXXII, Chapter 6, Revised Statutes

SEC. 2319. All valuable mineral deposits in lands belonging to the United States, both surveyed and unsurveyed, are hereby declared to be free and open to exploration and purchase, and the lands in which they are found to occupation and purchase, by citizens of the United States and those who have declared their intention to become such, under regulations prescribed by law, and according to the local customs or rules of miners in the several mining districts, so far as the same are applicable and not inconsistent with the laws of the United States.

Lode Claims

SEC. 2320. Mining claims upon veins or lodes of quartz or other rock in place bearing gold, silver, cinnabar, lead, tin, copper, or other valuable deposits, heretofore located, shall be governed as to length along the vein or lode by the customs, regulations, and laws in force at the date of their location. A mining claim located after the tenth day of May, eighteen hundred and seventy-two, whether located by one or more persons, may equal, but shall not exceed, one thousand five hundred feet in length along the vein or lode; but no location of a mining claim shall be made until the discovery of the vein or lode within the limits of the claim located. No claim shall extend more than three hundred feet on each side of the middle of the vein at the surface, nor shall any claim be limited by any mining regulation to less than twenty-five feet on each side of the middle of the vein at the surface, except where adverse rights existing on the tenth day of May, eighteen hundred and seventy-two, render such limitation necessary. The end lines of each claim shall be parallel to each other.

Citizenship

SEC. 2321. Proof of citizenship, under this chapter, may consist, in the case of an individual, of his own affidavit thereof; in the case of an association of persons unincorporated, of the affidavit of their authorized agent, made on his own knowledge, or upon information and belief; and in the case of a corporation organized under the laws of the United States, or of any state or territory thereof, by the filing of a certified copy of their charter or certificate of incorporation.

This is supplemented by an act of April 26, 1882, which provides:

"That applicants for mineral patents, if residing beyond the limits of the district wherein the claim is situated, may make any oath or affidavit required for proof of citizenship before the clerk of any court of record, or before any notary public of any state or territory." (22 Stats. at Large, p. 49, Chap. 106.)

Extralateral Rights

SEC. 2322. The locator of all mining locations heretofore made or which shall hereafter be made, on any mineral vein, lode, or ledge, situated on the public domain, their heirs and assigns, where no adverse claims exist on the tenth day of May, eighteen hundred and seventy-two, so long as they comply with the laws of the United States, and with state, territorial and local regulations not in conflict with the laws of the United States governing their possessory title, shall have the exclusive right of possession and enjoyment of all the surface included within the lines of their locations, and of all veins, lodes and ledges throughout their entire depth, the top or apex of which lies inside of such surface lines extended downward vertically, although such veins, lodes, or ledges may so far depart from a perpendicular in their course downward as to extend outside the vertical side lines of such surface locations. But their right of possession to such outside parts of such veins or ledges shall be confined to such portions thereof as lie between vertical planes drawn downward as above described through the end lines of their locations, so continued in their own direction that such planes will intersect such exterior parts of such veins or ledges. And nothing in this section shall authorize the locator or possessor of a vein, or lode which extends in its downward course beyond the vertical lines of his claim, to enter upon the surface of a claim owned or possessed by another.

Tunnel Claims

SEC. 2323. Where a tunnel is run for the development of a vein or lode, or for the discovery of mines, the owners of such tunnel shall have the right of possession

of all veins or lodes within three thousand feet from the face of such tunnel on the line thereof, not previously known to exist, discovered in such tunnel, to the same extent as if discovered from the surface and locations on the line of such tunnel of veins or lodes not appearing on the surface, made by other parties after the commencement of the tunnel, and while the same is being prosecuted with reasonable diligence, shall be invalid, but failure to prosecute the work on the tunnel for six months shall be considered as an abandonment of the right to all undiscovered veins on the line of such tunnel.

Recording and Annual Assessments

SEC. 2324. The miners of each mining district may make regulations not in conflict with the laws of the United States, or with the laws of the state or territory in which the district is situated, governing the location, manner of recording, amount of work necessary to hold possession of a mining claim, subject to the following requirements: The location must be distinctly marked on the ground so that its boundaries can be readily traced. All records of mining claims hereafter made shall contain the name or names of the locators, the date of the location, and such a description of the claim or claims located by reference to some natural object or permanent monument as will identify the claim. On each claim located after the tenth day of May, eighteen hundred and seventy-two, and until a patent has been issued therefor, not less than one hundred dollars' worth of labor shall be performed or improvements made during each year.

Be it enacted by the senate and house of representatives of the United States of America in congress assembled, that section two thousand, three hundred and twenty-four of the Revised Statutes be, and the same is hereby, amended so that where a person or company has or may run a tunnel for the purpose of developing a lode or lodes, owned by said person or company, the money so expended in said tunnel shall be taken and considered as expended on said lode or lodes, whether located prior to or since the passage of said act; and such person or company shall not be required to perform work on the surface of said lode or lodes in order to hold the same as required by said act. (18 Stats. at Large, page 315, Chap. 41.)

Patents

Section 2325 of the federal statutes provides that after \$500 has been expended on a mining claim in work or improvements, a patent can be applied for, upon the claim being surveyed by a United States mineral surveyor, and by the payment of \$5 per acre for the land to the United States government.

PLACERS

SEC. 2329. Claims usually called "placers" including all forms of deposit, excepting veins of quartz, or other rock in place, shall be subject to entry and patent, under like circumstances and conditions, and upon similar proceedings, as are provided for vein or lode claims; but where the lands have been previously surveyed by the United States, the entry in its exterior limits shall conform to the legal subdivisions of the public lands.

Areas of Placer Claims

SEC. 2330. Legal subdivisions of forty acres may be subdivided into ten-acre tracts, and two or more persons, or associations of persons, having contiguous claims of any size, although such claims may be less than ten acres each, may make joint entry thereof; but no location of a placer claim, made after the ninth day of July, eighteen hundred and seventy, shall exceed one hundred and sixty acres for any one person or association of persons, which location shall conform to the United States surveys; and nothing in this section contained shall defeat or impair any bona fide preemption or homestead claim upon agricultural lands, or authorize the sale of the improvements of any bona fide settler to any purchaser.

SEC. 2331. Where placer claims are upon surveyed lands, and conform to legal subdivisions, no further survey or plat shall be required, and all placer mining claims located after the tenth day of May, eighteen hundred and seventy-two, shall conform as near as practicable with the United States system of public lands surveys, and the rectangular subdivisions of such surveys, and no such location shall include more than twenty acres for each individual claimant; but where placer claims can not be conformed to legal subdivisions, survey and plat shall be made as on unsurveyed

lands; and where by the segregation of mineral land in any legal subdivision a quantity of agricultural land less than forty acres remains, such fractional portion of agricultural land may be entered by any party qualified by law, for homestead or preemption purposes.

Placer Boundaries

SEC. 2333. Where the same person, association, or corporation is in possession of a placer claim, and also a vein or lode included within the boundaries thereof, application shall be made for a patent for the placer claim, with the statement that it includes such vein or lode, and in such case a patent shall issue for the placer claim, subject to the provisions of this chapter, including such vein or lode upon the payment of five dollars per acre for such vein or lode claim, and twenty-five feet of surface on each side thereof. The remainder of the placer claim, or any placer claim not embracing any vein or lode claim, shall be paid for at the rate of two dollars and fifty cents per acre, together with all costs of proceedings; and where a vein or lode, such as is described in section twenty-three hundred and twenty, is known to exist within the boundaries of a placer claim, an application for a patent for such placer claim which does not include an application for the vein or lode claim shall be construed as a conclusive declaration that the claimant of the placer claim has no right of possession of the vein or lode claim; but where the existence of a vein or lode in a placer claim is not known, a patent for the placer claim shall convey all valuable mineral and other deposits within the boundaries thereof.



CALIFORNIA STATUTES REGARDING LOCATION OF MINING CLAIMS, MILL SITES AND ASSESSMENT WORK

An act to amend the Civil Code of California by adding a new title thereto, to be numbered title X, in part IV of division second, consisting of sections 1426, 1426a, 1426b, 1426c, 1426d, 1426e, 1426f, 1426g, 1426h, 1426i, 1426j, 1426k, 1426l, 1426m, 1426n, 1426o, 1426p, 1426q, 1426r, and 1426s, providing for the manner of locating lode and placer mining claims, tunnel rights, mill sites, and prescribing the character and amount of assessment work on mining claims, and providing for proofs of such work, and for the recordation of location notices, and proof of labor, and for the enforcement of contributions from delinquent co-owners of mining claims, and prescribing the duties of county recorders respecting the recording of location notices of, and proofs of labor on, mining claims, tunnel rights, and mill sites, and the fees to be charged therefor, and repealing acts in conflict herewith.

[Approved March 13, 1909.]

The people of the State of California, represented in senate and assembly, do enact as follows:

SECTION 1. The Civil Code of the State of California is hereby amended by adding a new title thereto, to be numbered title X, in part IV, of second division, consisting of sections 1426, 1426a, 1426b, 1426c, 1426d, 1426e, 1426f, 1426g, 1426h, 1426i, 1426j, 1426k, 1426l, 1426m, 1426n, 1426o, 1426p, 1426q, 1426r, and 1426s, to read as follows:

§ 1426. Any person, a citizen of the United States, or who has declared his intention to become such, who discovers a vein or lode of quartz, or other rock in place bearing gold, silver, cinnabar, lead, tin, copper, or other valuable deposit, may locate a claim upon such vein or lode, by defining the boundaries of the claim, in the manner hereinafter described, and by posting a notice of such location, at the point of discovery, which notice must contain :

First—The name of the lode or claim.

Second—The name of the locator or locators.

Third—the number of linear feet claimed in length along the course of the vein, each way from the point of discovery, with the width on each side of the center of the claim, and the general course of the vein or lode, as near as may be.

Fourth—The date of location.

Fifth—Such a description of the claim by reference to some natural object, or permanent monument, as will identify the claim located.

§ 1426a. The locator must define the boundaries of his claim so that they may be readily traced, and in no case shall the claim extend more than fifteen hundred feet along the course of the vein or lode, nor more than three hundred feet on either side thereof, measured from the center line of the vein at the surface.

§ 1426b. Within thirty days after the posting of his notice of location upon a lode mining claim, the locator shall record a true copy thereof in the office of the county recorder of the county in which such claim is situated, for which service the county recorder shall receive a fee of one dollar.

§ 1426c. The location of a placer claim shall be made in the following manner: By posting thereon, upon a tree, rock in place, stone, post or monument, a notice of location, containing the name of the claim, name of locator or locators, date of location, number of feet or acreage claimed, such a description of the claim by reference to some natural object or permanent monument as will identify the claim located, and by marking the boundaries so that they may be readily traced; *provided*, that where the United States survey has been extended over the land embraced in the location, the claim may be taken by legal subdivisions and no other reference than those of said survey shall be required and the boundaries of a claim so located and described need not be staked or monumented. The description by legal subdivisions shall be deemed the equivalent of marking.

§ 1426d. Within thirty days after the posting of the notice of location of a placer claim, the locator shall record a true copy thereof in the office of the county recorder of the county in which such claim is situated, for which service the recorder shall receive a fee of one dollar.

§ 1426e. The locator of a tunnel right or location, shall locate his tunnel right or location by posting a notice of location at the face or point of commencement of the tunnel, which must contain:

First—The name of the locator or locators.

Second—The date of the location.

Third—The proposed course or direction of the tunnel.

Fourth—A description of the tunnel, with reference to some natural object or permanent monument as shall identify the claim or tunnel right.

§ 1426f. The boundary lines of the tunnel shall be established by stakes or monuments placed along the lines at an interval of not more than six hundred feet from the face or point of commencement of the tunnel to the terminus of three thousand feet therefrom.

§ 1426g. Within thirty days after the posting the notice of location of the tunnel right or location, the locator shall record a true copy thereof, in the office of the county recorder of the county in which such claim is situated, for which service the recorder shall receive a fee of one dollar.

§ 1426h. If at any time the locator of any mining claim heretofore or hereafter located, or his assigns, shall apprehend that his original location notice was defective, erroneous, or that the requirements of the law had not been complied with before filing; or in case the original notice was made prior to the passage of this act, and he shall be desirous of securing the benefit of this act, such locator, or his assigns, may file an additional notice, subject to the provisions of this act; *provided*, that such amended location does not interfere with the existing rights of others at the time of posting and filing such amended location notice, and no such amended location notice or the record thereof, shall preclude the claimant, or claimants from proving any such title as he or they may have held under previous locations.

§ 1426i. Where a locator, or his assigns, has the boundaries and corners of his claim established by a United States deputy mineral survey, or a licensed surveyor of this state, and his claim connected with the corner of the public or minor surveys of an established initial point, and incorporates into the record of the claim, the field notes of such survey, and attaches to and files with such location notice a certificate of the surveyor, setting forth: *first*, that said survey was actually made by him, giving the date thereof; *second*, the name of the claim surveyed and the location thereof; *third*, that the description incorporated in the declaratory statement is sufficient to identify; such survey and certificate becomes a part of the record, and such record is *prima facie* evidence of the facts therein contained.

§ 1426j. The proprietor of a vein or lode claim or mine, or the owner of a quartz mill or reduction works, or any person qualified by the laws of the United States, may locate not more than five acres of non-mineral land as a mill site. Such location shall be made in the same manner as hereinbefore required for locating placer claims.

§ 1426k. The locator of a mill site claim or location shall, within thirty days from the date of his location, record a true copy of his location notice with the county recorder of the county in which such location is situated, for which service the recorder shall receive a fee of one dollar.

§ 1426l. The amount of work done or improvements made during each year to hold possession of a mining claim shall be that prescribed by the laws of the United States, to wit: One hundred dollars annually.

§ 1426m. Whenever [a] mine owner, company, or corporation shall have performed the labor and made the improvements required by law upon any mining claim, the person in whose behalf such labor was performed or improvements made, or some one in his behalf, shall within thirty days after the time limited for performing such labor or making such improvements make and have recorded by the county recorder, in books kept for that purpose, in the county in which such mining claim is situated, an affidavit setting forth the value of labor or improvements made, the name of the claim, and the name of the owner or claimant of said claim at whose expense the same was made or performed. Such affidavit, or a copy thereof, duly certified by the county recorder, shall be *prima facie* evidence of the performance of such labor or the making of such improvements, or both.

§ 1426n. For recording the affidavit herein required, the county recorder shall receive a fee of fifty cents.

§ 1426o. Whenever a co-owner or co-owners of a mining claim shall give to a delinquent co-owner or co-owners the notice in writing or notice by publication provided for in section 2324, Revised Statutes of the United States, an affidavit of the person giving such notice, stating the time, place, manner of service, and by whom and upon whom such service was made, shall be attached to a true copy of such

notice, and such notice and affidavit must be recorded in the office of the county recorder, in books kept for that purpose, in the county in which the claim is situated, within ninety days, after the giving of such notice; for the recording of which said recorder shall receive the same fees as are now allowed by law for recording deeds; or if such notice is given by publication in a newspaper, there shall be attached to a printed copy of such notice an affidavit of the printer or his foreman, or principal clerk of such paper, stating the date of the first, last and each insertion of such notice therein, and where the newspaper was published during that time, and the name of such newspaper. Such affidavit and notice shall be recorded as aforesaid, within one hundred and eighty days after the first publication thereof. The original of such notice and affidavit, or a duly certified copy of the record thereof, shall be prima facie evidence that the delinquent mentioned in section 2324 has failed or refused to contribute his proportion of the expenditure required by that section, and of the service of publication of said notice; *provided*, the writing or affidavit herein-after provided for is not of record. If such delinquent shall, within the ninety days required by section 2324, aforesaid, contributed to his co-owner or co-owners, his proportion of such expenditures, and also all costs of service of the notice required by this section, whether incurred for publication charges, or otherwise, such co-owner or co-owners shall sign and deliver to the delinquent or delinquents a writing stating that the delinquent or delinquents by name has within the time required by section 2324 aforesaid, contributed his share for the year_____, upon the_____ mine, and further stating therein the district, county and state wherein the same is situated, and the book and page where the location notice is recorded, if said mine was located under the provisions of this act; such writing shall be recorded in the office of the county recorder of said county, for which he shall receive the same fees as are now allowed by law for recording deeds. If such co-owner or co-owners shall fail to sign and deliver such writing to the delinquent or delinquents within twenty days after such contribution, the co-owner or co-owners so failing as aforesaid shall be liable to the penalty of one hundred dollars, to be recovered by any person for the use of the delinquent or delinquents in any court of competent jurisdiction. If such co-owner or co-owners fail to deliver such writing within said twenty days, the delinquent, with two disinterested persons having personal knowledge of such contribution, may make affidavit setting forth in what manner, the amount of, to whom, and upon what mine, such contribution was made. Such affidavit, or a record thereof, in the office of the county recorder of the county in which such mine is situated, shall be prima facie evidence of such contribution.

§ 1426p. The record of any location of a mining claim, mill site or tunnel right, in the office of the county recorder, as herein provided shall be received in evidence, and have the same force and effect in the courts of the state as the original notice.

§ 1426q. Copies of the records of all instruments required to be recorded by the provisions of this act, duly certified by the recorder, in whose custody such records are, may be read in evidence, under the same circumstances and rules as are now, or may be hereafter provided by law, for using copies of instruments relating to real estate, duly executed or acknowledged or proved and recorded.

§ 1426r. The provisions of this act shall not in any manner be construed as affecting or abolishing any mining district or the rules and regulations thereof within the State of California.

§ 1426s. The failure or neglect of any locator of a mining claim to perform development work of the character, in the manner and within the time required by the laws of the United States, shall disqualify such locators from relocating the ground embraced in the original location or mining claim or any part thereof under the mining laws, within three years after the date of his original location and any attempted relocation thereof by any of the original locators shall render such location void.

SEC. 2. All acts and parts of acts in conflict with this act, are hereby repealed.

SEC. 3. This act shall take effect and be in force on and after July 1, 1909.

FORMS FOR LOCATION NOTICES

The following forms for mineral location notices have been found to fill the requirements of the statutes, in California:

NOTICE OF QUARTZ LODE LOCATION

Notice is hereby given, That I, _____, have discovered a vein of rock in place, carrying valuable deposits, upon which I have erected a discovery monument and posted this notice, as hereinafter set forth; that in accordance with the provision of chapter VI, title XXXII of the Revised Statutes of the United States and the laws of the State of California, I hereby claim fifteen hundred linear feet of said vein, measured thereon as hereinafter set forth. Said discovery was made on the _____ day of _____, 19_____. Immediately upon making the same, and on the _____ day of _____, 19_____, I erected at the point of discovery, a substantial monument, consisting of a mound of rocks and _____ and posted thereon this notice.

The *general course of said vein is _____ and _____. I claim in length thereon _____ feet _____ and _____ feet _____ from said discovery monument. I also claim three hundred feet on each side of the center of the vein. This vein or claim shall be known as and called the _____ . It is situated in _____ Mining District, and in †Sec. _____, Tp. _____, R. _____, B. and M., in _____ County, California, and the discovery monument _____ being placed about § _____ from _____

That the following is a description of said location as marked upon the ground: ‡
commencing at the _____ of said claim, a _____ from which initial point the discovery monument is distant about _____ feet in a _____ direction; thence || _____

Dated, this _____ day of _____, 19_____

Locator.

* Make this description in accordance with the facts, as "The general course of said vein is north and south. I claim in length thereof (for example) 500 feet north and 1000 feet south from said discovery monument."

† If the claim is upon surveyed land, give the section, township and range, if possible. This is not required by law, but makes a much better description.

‡ Here refer to some natural object or permanent monument so as to identify the locality of the claim, in compliance with section 2324, Revised Statutes U. S. A road, house, tree, known mountain or peak, government corner, mill, or known mining claim, are such objects or monuments. As, "About one mile directly east from John Doe's quartz mill and 400 rods west from the Last Hope mine," etc.

§ Here state (for example): "Commencing at the NE. corner of said claim, a mound of rocks 4 ft. high," or at any other corner or point in the boundary; give the distance and direction from this initial monument to the discovery monument, and then locate the discovery with reference to some natural object or permanent monument.

|| Here follows a description of the claim from the initial monument. For instance: "Thence 600 ft. northwesterly to the NW. corner of said claim, at which point is a mound of rocks 2½ ft. high, marked so-and-so (if marked); thence 1500 ft. southwesterly to the SW. corner of said claim, being a mound of rocks," etc.; so going around the claim to the point of beginning.

NOTICE OF LOCATION OF PLACER CLAIM

Notice is hereby given, That _____ citizen _____ of the United States, h____ this _____ day of _____, 19_____, discovered a valuable placer deposit within the limits of this claim; that by virtue of said discovery, _____ ha____ located, and hereby locate and claim the following described land, situate in _____ Mining District, _____ County, California, to wit: * _____ of section _____ township _____, range _____, B. and M., containing _____ acres.† Said claim is hereby named _____ Placer Claim. Said claim is marked upon the ground as follows: ‡

This notice is posted on a mound of rocks at the point of discovery, situated §

Dated and posted on the ground, this _____ day of _____, 19_____.

Locator.

* The statute provides that the locator must give "a description of the claim by reference to legal subdivisions of sections, if the location is made in conformity with the public surveys; otherwise a description with reference to some natural object or permanent monument as will identify the claim."

† When not described by legal subdivisions, the description should conform to that contained in the final certificate of location of a lode claim.

‡ The statute provides that, whether described by legal subdivisions or not, the location shall be marked by the locator on the ground, and as the affidavit to be filed later is not required to contain a description of the claim, we think this notice should state how the location is marked; as, for instance, "At the NE corner of said tract a mound of rocks 3 ft. high, marked so-and-so (if marked), and at the NW corner a stake in a mound of rocks, marked," etc., and so on for each monument enclosing the claim.

§ Here state where the discovery is located, as, for instance, "20 feet SW of the NE corner monument."

NOTE: A duplicate of either of these notices must be filed for record with the county recorder within 30 days from the discovery; and the locator is allowed 30 days to mark his location on the ground.

The foregoing form of placer notice may be used for location of all deposits which are classed under placer laws and not excepted by The Leasing Act of February 25, 1920 (see Oil and Gas Rights, pp. 212-215, 218-285, *ante*.)

ADMINISTRATIVE DIVISION

WALTER W. BRADLEY, Deputy State Mineralogist

Personnel

Mr. Lloyd L. Root has resigned as State Mineralogist, effective August first, and will engage in private practice as consulting mining engineer. Mr. Root assumed the duties of the office in February, 1923, under appointment by Governor Friend W. Richardson.

Mr. Walter W. Bradley, for the past five and a half years deputy state mineralogist, has been appointed State Mineralogist and Chief of the Division of Mines and Mining, succeeding Lloyd L. Root, resigned. Mr. Bradley joined the staff of the State Mining Bureau on January 8, 1912, as Librarian, and has advanced through the several positions of field engineer, statistician and curator, and deputy state mineralogist. He is a graduate of the University of California, College of Mining, 1901, receiving also the degree of Mining Engineer (of doctorate rank at California) in 1918. In announcing this selection for state mineralogist Mr. Fred G. Stevenot, director of the State Department of Natural Resources, states that the present administration is adopting a policy of promotion from within rather than political appointment from without. He adds: "I am fully convinced that every encouragement should be held out to subordinates of proven ability to expect that they be granted the privilege whenever possible of being advanced to the highest position within the various divisions."

Mr. Charles V. Averill is district mining engineer in charge of the branch office at Redding, which was reestablished May 8, 1928. Mr. Averill is a graduate of the University of California, with subsequent engineering experience in Nevada and California.

Redding Branch Office

The territory assigned to the Sacramento district being too extensive to be covered effectively by a single engineer, it was deemed advisable to divide the northern area of the state and place an engineer in Redding, where he will be in closer touch with mineral developments and the operators in the northern counties. Through the courtesy and cooperation of the Redding Chamber of Commerce, office space has been provided in their quarters.

The counties assigned to the Redding district are Del Norte, Humboldt, Lassen, Modoc, Plumas, Shasta, Siskiyou, Tehama and Trinity.

New Publications

During the quarterly period covered by this issue, the following publications of the Division of Mines and Mining have been made available for distribution:

Mining in California (quarterly), January, 1928 and April, 1928, being Chapters 1 and 2, respectively, of State Mineralogist's Report XXIV. Price 25 cents, each. The January issue contains a report on the Mineral Resources of Tuolumne County; and the April, a report on the Mineral Resources of Mariposa County.

Summary of Operations, California Oil Fields, Vol. 13, Nos. 6 and 7, December, 1927, and January, 1928, respectively. These contain articles on: "Production Records and Methods of Measuring Fluids," and "Report on the Kern Front Area of the Kern River Oil Field."

Commercial Mineral Notes, Nos. 61, 62, 63, 64, April, May, June, July, 1928, respectively. These "notes" contain the lists of "mineral deposits wanted" and "minerals for sale" issued in the form of a mimeographed sheet monthly. It is mailed free to those on the mailing list for MINING IN CALIFORNIA.

Mails and Files

The Division of Mines maintains, in addition to its correspondence files and the library, a mine file which includes original reports on the various mines and mineral properties of all kinds in California.

During each quarterly period there are several thousand letters received and answered at the San Francisco office alone, covering almost every phase of prospecting, mining, and developing mineral deposits, reduction problems, marketing of refined products, and mining law. In addition to this, hundreds of oral questions are answered daily, both at the main office and the district offices, for the many inquirers who come in for personal interviews and to consult the files and library.



DIVISION OF MINERALS AND STATISTICS

Statistics, Museum, Laboratory

HENRY H. SYMONS, Statistician and Curator

STATISTICS

Data on the 1927 production of several California minerals were given in the April issue of *Mining in California*, and some additional ones are presented herein. Copy of the complete annual report for the year is now being prepared and will shortly go to the printer as Bulletin No. 101 of the Division of Mines and Mining.

COPPER

Copper is second only to gold among the metals mined in California. The output for 1927 amounted to a total of 27,350,316 pounds of recoverable metal valued at \$3,582,888, a decrease from the 1926 figures of 33,521,544 pounds and \$4,693,014. The average price of copper for 1927 was 13.1 cents per pound against 14.0 cents in 1926.

As for several years past, Plumas County ranks first for 1927, with an output of 21,055,425 pounds; Shasta second with 4,524,906 pounds; and Trinity third with 770,882 pounds.

Distribution of the 1927 copper output by counties was as follows:

<i>County</i>	<i>Pounds</i>	<i>Value</i>
Calaveras	750,909	\$98,367
Inyo	30,010	3,931
Plumas	21,055,425	2,758,261
Riverside	19,201	2,515
San Bernardino	197,132	25,824
Shasta	4,524,906	592,763
Trinity	770,882	100,986
Amador, Butte, El Dorado, Imperial, Kern, Los Angeles, Mono, Napa, Nevada, San Luis Obispo, Sierra*	1,851	241
Totals	27,350,316	\$3,582,888

* Combined to conceal output of a single operator in each.

GOLD

The production of gold in California in 1927 totaled 564,585.50 fine ounces, worth \$11,671,018, being a decrease of 12,212.90 fine ounces from the 1926 yield. The 'deep' or lode mines output accounted for \$5,833,705, and the placers (mainly the dredges) produced \$5,837,313. As the Division of Mines and Mining has never independently gathered the statistics of gold and silver production, these figures, as in former years, are published by cooperation with and through the courtesy of Mr. J. M. Hill of the Division of Minerals and Statistics, U. S. Bureau of Mines.

The largest gold production for 1927, is reported from Yuba County with an output of 167,774.20 fine ounces (\$3,468,201); Nevada County with 102,903.07 fine ounces (\$2,127,195), second; Amador County with 93,011.27 fine ounces (\$1,922,714), third; Sacramento County with 58,595.57 fine ounces, fourth; followed by Sierra and Trinity counties in fifth and sixth places, respectively. It will be noted, as in 1926, Yuba County was the largest gold producer with Nevada, Amador, and Sacramento following, respectively, in the same order. The Yuba and Sacramento production came almost entirely from dredges, while that from Nevada and Amador came mainly as lode gold.

GOLD PRODUCTION BY COUNTIES FOR 1927

County	Value	County	Value
Alpine	\$146	Monterey	\$500
Amador	1,922,714	Napa	7,235
Butte	143,494	Nevada	2,127,195
Calaveras	219,217	Placer	97,494
Del Norte	334	Plumas	321,016
El Dorado	82,254	Riverside	1,492
Fresno	17,406	Sacramento	1,211,278
Humboldt	1,729	San Bernardino	82,225
Imperial	257	San Diego	11,490
Inyo	10,109	Shasta	191,900
Kern	171,100	Sierra	678,873
Lassen	531	Siskiyou	138,822
Los Angeles	2,345	Stanislaus	120,238
Madera	4,181	Trinity	409,492
Mariposa	183,805	Tuolumne	40,209
Mono	3,686	Yuba	3,468,201
		Total	\$11,671,018

LEAD

The production of lead in California in 1927 was 2,748,440 pounds of recovered metal valued at \$173,235 as against the production of 1926 of 8,067,873 pounds valued at \$645,429. The average price of lead in 1927 was 6.3 cents a pound against 8.0 cents in 1926 and 8.7 cents in 1925.

As in the past the principal output of lead was from the lead-silver ores of Inyo County.

Lead production by counties for 1927:

County	Pounds	Value
Amador	2,491	\$157
Calaveras	4,606	290
Inyo	2,173,032	136,901
Los Angeles	312,645	19,697
Mono	4,830	304
Riverside	121,667	7,665
San Bernardino	125,692	7,919
Shasta	1,780	112
Butte, Nevada, Plumas*	1,691	106
Totals	2,748,440	\$173,151

* Combined to conceal output of a single operator in each.

PETROLEUM

The crude petroleum produced in California for 1927, amounted to a total of 231,195,773 barrels of clean oil, valued at \$260,735,491 at the well. This total of quantity is compiled from the monthly production reports filed by the operators with the State Oil and Gas Supervisor, to which have been added figures for the output of a number of small operators in the old Los Angeles City field not under the jurisdiction of the Supervisor.

The question of the value of the crude oil yield at the well is a difficult one to settle with exactitude, principally because a large part of the output is not sold until after refined. The large refiners are also large producers of crude oil which they send direct from the well to the refinery, hence much of the crude oil is not sold as such. The value used in the statistical reports of the Division of Mines and Mining since 1914 has been derived from the average of actual sales of crude oil of all grades in each field of the state, and the averages applied to the total yield of the respective fields. This we feel is a safer measure of commercial values than market quotations, because quotations do not always mean sales. This is particularly true on a rising or a falling market.

The following table gives the production and value by counties for 1927, compared with the 1926 figures:

<i>County</i>		<i>1926</i>		<i>1927</i>	
		<i>Barrels</i>	<i>Value</i>	<i>Barrels</i>	<i>Value</i>
Fresno -----	7,340,102	\$5,982,183	7,202,285	\$5,977,176	
Kern -----	54,549,646	78,987,887	51,570,412	58,738,699	
Los Angeles -----	105,826,337	174,084,324	103,625,615	114,583,011	
Orange -----	37,989,349	59,225,395	46,593,842	56,238,767	
San Luis Obispo-----	27,982	22,162	16,709	12,531	
Santa Barbara -----	1,925,204	1,526,587	2,173,887	1,630,415	
Santa Clara -----	a			11,994	14,212
Ventura -----	16,994,275	25,695,344	19,996,841	23,536,282	
Kings, San Bernardino, San Mateo, Santa Clara, Sonoma-----	20,386	22,795			
Kings, San Bernardino, San Mateo, Sonoma -----			a4,188	4,398	
Totals-----	224,673,281	\$345,546,677	231,195,773	\$260,735,491	

^a Combined to conceal output of a single operator in each.

OIL IN 'STORAGE'

Field, refinery, pipe-line and tank-farm stock of crude and refinery products in the Pacific Coast territory totals 137,395,067 barrels¹, December 31, 1927, compared with 145,612,176 barrels on December 31, 1926. The total decrease in stock for the year was 8,217,109.

<i>Stock</i>		<i>Dec. 31, 1927</i>	<i>Dec. 31, 1926</i>
Heavy crude, heavier than 20° A. P. I., including all grades of fuel-----		93,013,061	88,707,499
Refinable crude 20° A. P. I. and lighter-----		20,268,569	30,835,057
Gasoline -----		12,725,841	11,673,563
Naptha distillates -----		1,901,279	3,832,042
All other stocks-----		9,486,317	10,564,015
Totals of all stock-----		137,395,067	145,612,176

¹ Standard Oil Bulletin, February, 1928, p. 11.

PROVED OIL LAND

The total proved oil land of the state is 125,131 acres, an increase during 1927 of 3,696 acres. Of this amount 23,927 acres, being owned by Federal, State and City governments, or for other reasons, is not assessable for the support of the Department of Petroleum and Gas of the Division of Mines and Mining. The acreage in 1927 was distributed by counties as follows:

<i>County</i>		<i>Land</i>	<i>Number of wells</i>
Fresno -----		14,665	985
Kern -----		80,075	5,574
Los Angeles -----		10,794	3,311
Orange -----		6,797	1,422
San Luis Obispo -----		308	18
Santa Barbara -----		7,474	329
Santa Clara -----		80	4
Ventura -----		4,938	699
Kings, San Bernardino and Sonoma-----			3
Totals -----		125,131	12,345

PLATINUM

In California the platinum group metals are obtained as a by-product from placer operations for gold. The major portion of it comes from the dredges working in Butte, Sacramento, Stanislaus and Shasta counties, with a small amount coming from the hydraulic and

surface-sluicing mines of Del Norte, Humboldt, Siskiyou, and Trinity counties.

The production of platinum metals in California for 1927 totaled 183 ounces, crude, containing 139 fine ounces, valued at \$10,757, compared with the 1926 figures of 322 fine ounces and \$32,005. Of this amount 102 fine ounces or 73% came from the gold dredges. In addition to the above metal there was some platinum mined but not sold in 1927 in Butte, Trinity and Yuba counties.

Of the above 183 fine ounces, at least 37 fine ounces were iridium, osmium, palladium and ruthenium. Most of the platinum refiners pay for the osmiridium on the basis of its iridium content. Crude 'platinum' is really a mixture of the metals of that group, and carries varying percentages of platinum, iridium, osmiridium or iridosmine, with occasionally some ruthenium and palladium. In addition to the above-noted production, there is usually some platinum recovered as a by-product in the gold refinery of the mint, but which can not be assigned to the territory of its origin for lack of knowing to which lots of gold it belongs. Some platinum and palladium are also recovered in the electrolytic refining of blister copper.

For 1926, the distribution by counties of California's platinum yield was as follows:

County	Fine ounces	Value
Butte ^a	7	\$499
Shasta ^a	26	2,505
Siskiyou	9	690
Del Norte, Humboldt, Sacramento ^b , Stanislaus ^a and Trinity*	97	7,057
Totals	139	\$10,751

* Combined to conceal output of a single operator in each.

^a Includes iridium and osmium.

^b Includes iridium, osmium, palladium and ruthenium.

QUICKSILVER

The production of quicksilver for 1927 in California was 6488 flasks (of 75 pounds, avoirdupois) valued at \$714,418. This was an increase in both quantity and value over the 1926 figure of 5892 flasks, valued at \$516,382. This production came from Lake, Monterey, Napa, Orange, San Benito, San Luis Obispo and Sonoma counties, the largest production coming from San Benito, with Napa in second place.

The average price for quicksilver in 1927 was \$117.25 for 76 pounds flask at San Francisco or \$115.71 for 75 pounds against \$87.64 per 75-pound flask in 1926.

SILVER

Except for the early-day production from the silver mines of the Calico district and the more recent production from those of the Randsburg area, both of which are in San Bernardino County, the recovery of silver in California has been largely as a by-product from its association with copper, lead, zinc, and gold ores.

The 1927 silver production of California totaled 1,620,242 fine ounces valued at \$918,677, compared with 2,022,460 ounces valued at \$1,262,015 in 1926. Of the 1927 yield, 20,903 ounces valued at \$11,852 came from placers. The average price of domestic silver during 1927 was 56.7 cents per ounce in New York against 62.4 cents in 1926.

The distribution of the 1927 silver yield, by counties, was as follows:

SILVER PRODUCTION BY COUNTIES

<i>County</i>	<i>Fine ounces</i>	<i>Value</i>
Alpine	105	\$60
Amador	19,963	11,319
Butte	655	371
Calaveras	7,023	3,982
Del Norte	2	1
El Dorado	675	383
Fresno	136	77
Humboldt	25	14
Imperial	5	3
Inyo	83,570	47,384
Kern	15,753	8,932
Lassen	16	9
Los Angeles	26,135	14,819
Madera	67	38
Mariposa	2,427	1,376
Mono	38,487	21,822
Monterey	4	2
Napa	99,532	56,435
Nevada	48,644	27,581
Placer	776	440
Plumas	315,887	179,108
Riverside	3,385	1,919
Sacramento	2,596	1,472
San Bernardino	788,580	447,125
San Diego	162	92
Shasta	123,917	70,261
Sierra	5,909	3,350
Siskiyou	1,033	586
Stanislaus	608	345
Trinity	21,739	12,326
Tuolumne	533	302
Yuba	11,893	6,743
Totals	1,620,242	\$918,677

ZINC

The recoverable zinc mined in California in 1927 amounted to 8,625,004 pounds valued at \$552,000, compared with 20,447,559 pounds and \$1,533,568 in 1926. The production came from Shasta, Los Angeles (Santa Catalina Island), and Riverside counties, and was shipped in the form of concentrates and sinter to Belgium, though a small amount is used in the manufacture of oxide.

The average price per pound quoted for the metal in 1927, was 6.4 cents as against 7.5 cents in 1926.

MUSEUM.

The Museum of the State Mining Bureau possesses an exceptionally fine collection of rocks and minerals of both economic and academic value. It ranks among the first five of such collections in North America; and contains not only specimens of most of the known minerals found in California, but much valuable and interesting material from other states and foreign countries as well.

Mineral specimens suitable for exhibit purposes are solicited, and their donation will be appreciated by the State Mining Bureau as well as by those who utilize the facilities of the collection.

The exhibit is daily visited by engineers, students, business men, and prospectors as well as tourists and mere sightseers. Besides its practical use in the economic development of California's mineral resources, the collection is a most valuable educational asset to the state and to San Francisco.

LABORATORY

FRANK SANBORN, Mineral Technologist

The demand for caesium and beryllium appears to be greater than the present supply. The main source of caesium is the mineral pollucite, while beryl is the chief ore of beryllium.

Pollucite has been found at Mesa Grande, San Diego County. It is quite possible that this mineral occurs in other sections of the state, but has not been identified on account of its close resemblance to quartz. Pollucite resembles quartz, but the fact that it is decomposed by hydrochloric acid aids as a field test to distinguish it from quartz.

Caesium is a silver-white, soft, ductile metal. It oxidizes in the air with the production of light and heat, and decomposes violently in water at ordinary temperatures. Compounds of caesium have been until recently used chiefly in chemistry, but its use has now been extended to radio, and therefore the increased demand.

Beryl has been found in a number of different localities in California, but the greatest amount so far known occurs in feldspathic pegmatite veins in Riverside and San Diego counties. It has also been reported from San Bernardino and other counties. Pegmatites of these districts may yield pollucite, and prospectors should look for this mineral.

Approximately thirty samples per day are received and determined at this laboratory, proving that the public is showing a live and increasing desire to find commercial deposits of nonmetals as well as metallic deposits.



LIBRARY

E. A. LOWE, Librarian.

In addition to the numerous standard works, authoritative information on many phases of the mining and mineral industry is constantly being issued in the form of reports and bulletins by various government agencies.

The library of the Division of Mines and Mining contains some five thousand selected volumes on mines, mining and allied subjects, and it is also a repository for reports and bulletins of the technical departments of federal and state governments and of educational institutions, both domestic and foreign.

It is not the dearth of the latter publications, but rather a lack of knowledge of just what has been published and where the reports may be consulted or obtained, that embarrasses the ordinary person seeking specific information.

To assist in making the public acquainted with this valuable source of current technical information, *MINING IN CALIFORNIA* contains under this heading a list of all books and official reports and bulletins received, with names of publishers or issuing departments.

Files of all the leading technical journals will be found in the library, and county and state maps, topographical sheets and geological folios. Current copies of local newspapers published in the mining centers of the state are available for reference.

The library and reading room are open to the public during the usual office hours, when the librarian may be freely called upon for all necessary assistance.

OFFICIAL PUBLICATIONS RECEIVED

Governmental

U. S. Geological Survey:

Professional Papers:

- 150-F—Notes on Pleistocene Faunas from Maryland and Virginia and Pliocene and Pleistocene Faunas from North Carolina. By Wendell C. Mansfield.
- 150-E—The Pocono Fauna of the Board Top Coal Field, Pennsylvania. By George H. Girty.
- 150-D—Sedimentary Rocks of the San Rafael Swell and Some Adjacent Areas in Eastern Utah. By James Gilluly and John B. Reeside, Jr.
- 142-E—The Molluscan Fauna of the Alum Bluff Group of Florida. By Julia Gardner.

Bulletins:

- 806 —Bibliography of North American Geology for 1925 and 1926. By John M. Nickles.
- 793 —Economic Geology of the Castlegate, Wellington and Sunnyside Quadrangles, Carbon County, Utah. By Frank R. Clark.
- 795 —Contributions to Economic Geology, Part I—Metals and Non-metals except Fuels. By G. F. Loughlin and G. R. Mansfield.
- 796 —Contributions to Economic Geology, Part II—Mineral Fuels.
- 796-B—Geology and Oil Prospects of Northeastern Colorado. By Kirtley F. Mather, James Gilluly and Ralph G. Lusk.
- 788-F—Topographic Instructions of the United States Geological Survey. By T. P. Pendleton.
- 788-E—Topographic Instructions of the United States Geological Survey. By W. M. Beaman.

Water Supply Papers:

- 596-G—Chemical Character of Waters of Florida. By W. D. Collins and C. S. Howard.
- 577 —Plants as Indicators of Ground Water. By Oscar Edward Meinzer.
- 579 —Power Capacity and Production in the United States. By C. R. Daugherty, A. H. Horton, and R. W. Davenport.
- 573 —Surface Water Supply of the United States. 1923, Part XII—North Pacific Slope Drainage Basins. B. Snake River Basin.
- 587 —Surface Water Supply of the United States, 1924, Part VII—Lower Mississippi River Basin.
- 585 —Surface Water Supply of the United States, 1924, Part V—Hudson Bay and Upper Mississippi River Basins.
- 582 —South Atlantic Slope and Eastern Gulf of Mexico Basins.
- 576 —The Ground-Water Resources of Mississippi.
- 571 —Pacific Slope Basins in California.

Hawaiian Volcano Observatory: Monthly Bulletin of the, Vol. XV, Nos. 2, 3, 4, 5, 6, 7, 8, 9.

U. S. Bureau of Mines:

Technical Papers:

- 424 —Thermodynamic Properties of Oxygen and Nitrogen. By Russell W. Millar and John D. Sullivan.
- 411 —Analyses of Oklahoma Coals. By C. L. Cooper.
- 416 —Analyses of Arkansas Coals. By George C. Branner.
- 421 —State Laws Relating to Coal-Mine Timbering. By J. W. Paul and J. N. Geyer.
- 418 —Electric-Furnace Cast Iron. By C. W. Williams and C. E. Sims.
- 429 —Permissible Single-Shot Blasting Units. By L. C. Ilsley and A. B. Hooker.
- 414 —Methods of Dealing with Paraffin Troubles Encountered in Producing Crude Oil. By C. E. Reistle, Jr.
- 433 —Experiments in Underground Communication Through Earth Strata. By L. C. Ilsley, H. B. Freeman and D. H. Zellers.
- 427 —Propagation of Flame in Mixtures of Natural Gas and Air. By H. F. Coward and H. P. Greenwald.

Bulletins:

- 279 —Limits of Inflammability of Gases and Vapors. By H. F. Coward and G. W. Jones.
- 291 —Tabulated Analyses of Representative Crude Petroleums of the United States. By N. A. C. Smith and E. C. Lane.

Miners' Circulars:

- 30 —Use of the Miners' Self-Rescuer. By S. H. Katz and J. J. Forbes.
- 31 —Questions and Answers on Timbering Bituminous Coal Mines. By J. W. Paul.

Mineral Resources of the United States:

- Cement in 1926.
- Sand and Gravel in 1926.
- Lead in 1926.
- Gold, Silver, Copper, Lead and Zinc in California and Oregon in 1926.
- Secondary Metals in 1926.
- Sulphur and Pyrites in 1926.
- Gold, Silver, Copper, Lead and Zinc in Montana in 1926.
- Gold, Silver, Copper, Lead and Zinc in Idaho and Washington in 1926.
- Petroleum in 1926.
- Part I, Metals. Part II, Nonmetals.
- Statistical Summary of the California Petroleum Industry, 1927.
- List and Index of Bureau of Mines Reports of Investigations and Information Circulars.

Reports of Investigations:

- 2859—Portable Electric Cap Lamps in Alabama. By Frank E. Cash.
 (Reviews progress made in Alabama in the introduction of permissible portable electric cap lamps, recommended by Bureau of Mines as safest type for use in mines. Gives list of lamps used, with descriptions and suggestions regarding use and maintenance.)

- 2860—Flotation of Low-Grade Phosphate Ores. By H. M. Lawrence and F. D. DeVaney.
(Present results so far attained in use of flotation process to obtain higher recoveries of phosphate rock than are now being achieved in Florida district.)
- 2861—Seventeenth Semi-Annual Motor Gasoline Survey. By E. C. Lane, Peter Grandone and D. B. Taliaferro, Jr.
(Summarizes characteristics of representative motor gasoline samples collected in eleven cities, thus affording information as to nature of motor gasolines being used throughout the United States.)
- 2862—A Rapid Corrosion Test for Gasoline. By H. P. Rue.
(Gives details of a mercury corrosion test which offers possibilities in the proper control of gasoline treating plants.)
- 2863—Explosibility of Sulphide Dusts in Metal Mines. By E. D. Gardner and Edmund Stein.
(Gives results of a study of a high sulphur ore from a metal mine in which a serious accident had occurred due to an explosion and burning of sulphide dust. Points out that massive sulphides occurring in metal mines are inflammable and furnish the fuel for many mine fires.)
- 2864—Official Changes in the Active List of Permissible Explosives for March, 1928.
(Supplements latest complete active list of permissible explosives, published in July, 1927, as Serial 2818.)
- 2865—Rock-Strata Gases in the Cripple Creek District and Their Effect on Mining. By E. H. Denny, K. L. Marshall, and A. C. Fieldner.
(Gives results of study of gases which have caused numerous fatalities in this district, and recommends remedial measures.)
- 2866—A Comparison of the Results Obtained With the Oxygen-Bomb and Carius Methods in Determining Sulphur in the Heavier Petroleum Oils. By John M. Devine and F. W. Lane.
(Summarizes tests which indicate that the simpler oxygen-bomb method of determining sulphur in petroleum is entirely adequate for routine laboratory work and also for research purposes unless results of the highest accuracy are essential.)
- 2867—Titanium in Bauxite Ores and Sludges. By Will H. Coghill.
(Contains data obtained in study of waste sludge containing over 75,000 pounds of titanium dioxide discharged daily at a bauxite lixiviation plant, and discusses titanium content of various bauxite ores.)
- 2868—Insulated Mine-Car Couplings. By F. E. Cash and C. W. Owings.
(Describes four types of insulated mine car couplings devised for the prevention of accidents in electric haulage of explosives in mines due to electric current passing from the locomotive through the couplings to the cars.)
- 2869—The Production of High-Alumina Slags in the Blast Furnace for the Manufacture of Alumina Cement. By T. L. Joseph.
(Discusses economic possibilities of production of high-alumina slags for manufacture of alumina cement through operation of blast furnace on a charge of bauxite, limestone and iron ore.)
- 2870—The Occurrence of Jarosite Minerals in Oxidized Lead Ores as a Factor in Metal Losses. By R. E. Head and Virgil Miller.
(Points out that the occurrence of jarosite minerals in oxidized lead ores, often overlooked by metallurgists, is responsible for large losses in treatment of these ores, and suggests modified methods of treatment.)
- 2871—Flue Dusts from Copper Smelters of the Southwest: Composition and Methods of Treatment. By William A. Sloan.
(Discusses proposed hydrometallurgical processes for recovery of valuable metallic flue dusts in substitution for present practice of returning dusts to smelting furnaces for retreatment.)
- 2872—The Use of Brattice Cloth in Coal Mines. By George S. Rice and C. W. Owings.
(Contains information in regard to nature, cost, use and deterioration of brattice cloth, used in large quantities in ventilation of coal mines.)
- 2873—Notes on Extraction and Recovery of Radium, Vanadium, and Uranium from Carnotite. By H. A. Doerner.

(Gives details of a modified nitric acid method for recovery of radium now discarded in carnotite tailings from which the vanadium has been extracted.)

2874—Milling Baboquivari Ores. By Edmund S. Leaver and Jesse A. Woolf.

(Outlines suggested method for cyanide extraction of silver and gold content of metallurgically difficult ores in Baboquivari, Arizona, mining district.)

2875—Accident—Severity Rates for Certain Mines and Quarries in 1927. By W. W. Adams.

(Gives detailed results of a nation-wide safety contest in which more than 250 mines and quarries participated.)

2876—Use of the Acetylene Tetrachloride Method of Porosity Determination in Petroleum Engineering Field Studies. By Chase E. Sutton.

(Gives results of tests made in Texhoma-Gose oil pool, Texas, of a method which has various advantages for determining the average porosity of oil sands, essential to an engineering study of underground conditions.)

2877—Flotation of Fluorspar Ores for Acid Spar. By Will H. Coghill and O. W. Greeman.

(Outlines suggested method for flotation of fluorspar ores as a means of making more acid spar available, thus giving a better balance to markets in which gravel spar greatly predominates.)

2878—Copper Milling Research in Michigan. By A. W. Fahrenwald.

(Contains details of flotation tests of Michigan native copper ores, which promise increased recovery of copper with a substantial reduction in production costs.)

Information Circulars:

6062—Natural-Gasoline Plants in the United States. By G. R. Hopkins and E. M. Seeley.

(Gives results of statistical survey of natural-gasoline plants operating as of January 1, 1928. Contains list of such plants, arranged by states, with data as to type and daily capacity.)

6063—Mine Rescue Organization in the Coeur d'Alene Mining District, Idaho. By W. J. Fene and Hugh McDermott.

(Describes housing facilities, equipment and rescue training program of one of the most complete mine-rescue organizations in the United States.)

6064—Accident-Prevention Work of the Midwest Refining Company. By E. H. Denny.

(Outlines accident prevention methods employed by a large oil refining company which has been notably successful in its safety endeavors.)

6065—Petroleum Refineries in the United States, January 1, 1928. By G. R. Hopkins.

(Gives results of statistical survey of petroleum refineries operating in the United States as of January 1, 1928. Contains complete list of refineries, with data as to daily capacity, type of plant, and railroad connections.)

6066—Form of Report for Underground Accidents. By E. D. Gardner and D. J. Parker.

(Presents suggested detailed outline for accident report to general manager of mine, which it is thought should be of value in the study of mine accidents and their prevention.)

6067—Touch Paper. By D. J. Parker.

(Describes method of blasting in coal mines by use of the so-called "touch paper," points out the hazards of the practice, and recommends substitution of other methods.)

6068—Development and Safety of the Storage-Battery Locomotive. By L. C. Iisley.

(Reviews development of the storage-battery locomotive used in coal-mining operations, and stresses advisability of using in gassy mines only such locomotives as have been approved by Bureau of Mines as "permissible."

6069—The Mining of Gilsonite in Utah. By W. J. Fene.

(Describes methods used in mining of this asphaltic material, and contains historical account of development of this industry.)

6070—Hazards in Connection with Concentrated Coal Mining. By D. Harrington.

(Summarizes hazards involved in mining of coal by modern mechanical mining systems and gives recommendations as to safe operation in such concentrated systems of mining.)

6071—Exports of Mineral Oils from Gulf Coast Ports in 1927. By Arthur H. Redfield.

(Statistical summary of exports of gasoline, kerosene, fuel oil and gas oil, with tabulation showing to which countries these materials were shipped.)

6072—Russian Papers on Measurements of Terrestrial Radioactivity. By L. N. Bogoiaavlensky, A. A. Lomakin, and A. Cherepenikov, with a supplementary chapter on Radioactive Substances and Methods for Locating Them. By F. W. Lee.

(Translations of papers by various Russian authors dealing with the use of radioactive indications for determining the location of underground mineral deposits. Includes brief bibliography on radioactivity and its application to geophysical prospecting for minerals.)

6073—Fires and Fire Prevention in Lake Superior Mines. By F. C. Gregory.

(A review of the mine fire record of the Lake Superior metal mining district, with information as to costs of fires, fire prevention results and fire fighting methods.)

U. S. National Museum :

Zeolites from Ritter Hot Springs, Grant County, Oregon. By D. F. Hewett, Earl B. Shannon and Forest A. Gonyer.

Concerning the Origin of the Metal in Meteorites. By Geo. P. Merrill.

Colorado Bureau of Mines: Annual Report for the Year 1927.

Connecticut State Geological and Natural History Survey: Bulletin No. 42—The Algae of Connecticut. By Clarence John Hylander, Ph. D.

Idaho Bureau of Mines and Geology :

Pamphlet No. 26—Geology and Ore Deposits of Rocky Bar Quadrangle. By S. M. Ballard.

Pamphlet No. 27—Geology and Ore Deposits of the Birch Creek District, Idaho. By P. J. Shenon.

Idaho Inspector of Mines :

Twenty-ninth Annual Report on the Mining Industry of Idaho for the Year 1927.

Illinois Geological Survey :

Bulletin 53—Geology and Economic Resources of the St. Peter Sandstone of Illinois. By J. E. Lamar.

Bulletin 54—Oil and Gas East-Central Illinois. By L. A. Mylius.

Report of Investigations No. 15—Preliminary Report on the Fullers Earth Deposits of Pulaski County. By J. E. Lamar.

Report of Investigations No. 16—The Oil and Gas Resources of the Avoca-Campbell Hill Area. By Towner B. Root.

Iowa Geological Survey :

Annual Report of 1925-1926, Vol. XXXII.

Kentucky Geological Survey :

Series VI—Ancient Life in Kentucky. By William Snyder Webb and William Delberry Funkhouser.

Early Carbonic Deformation in Western Kentucky. By Willard R. Jillson.

Mississippi Geological Survey :

Bulletin 21—Recent Oil and Gas Prospecting in Mississippi With a Brief Study of Subsurface Geology. By Ralph E. Grim.

Bulletin 22—Preliminary Report on Bentonite in Mississippi. By Ralph E. Grim.

Nebraska Geological Survey :

Bulletin II, Second Series—The Fusulinidae of the Pennsylvanian System in Nebraska. By Carl O. Dunbar and G. E. Condra.

Ohio Geological Survey:

Fourth Series Bulletin 33—Mineral Industries of Ohio. By J. A. Bownocker and W. Stout.

Oklahoma Geological Survey:

Bulletin 44—Age Relation of the Carboniferous Rocks of the Ouachita Mountains of Oklahoma and Arkansas. By Hugh D. Miser and C. W. Honess.

Bulletin 12—Preliminary Report on the Geology of the Arbuckle and Wichita Mountains in Indian Territory and Oklahoma. By J. A. Taff.

Oklahoma Geological Survey:

Circular No. 15—Physical Characteristics of the Arbuckle Limestone. By Charles E. Decker and Clifford A. Merritt.

Circular No. 16—Oklahoma, the Geologists' Laboratory. By Chas. N. Gould.

Pennsylvania Topographic and Geological Survey:

Bulletins:

94—High Spots in Pennsylvania. By George H. Ashley.

M6, Part III—Coal Resources—Bituminous Coal Fields of Pennsylvania. By John F. Reese and James D. Sisler.

M10—Fire Clays of Pennsylvania. By J. B. Shaw.

M11—Molding Sands of Pennsylvania. By R. W. Stone and American Foundrymen's Association.

Virginia Geological Survey:

Bulletins:

28—Fenster in the Cumberland Overthrust Block in Southwestern Virginia. By Charles Butts.

29—The Geology of the Virginia Triassic. By Joseph K. Roberts.

West Virginia Geological Survey:

Bulletin 3—The Cheat Mountain Coal Field of Randolph County, West Virginia. By David B. Reger.

County Reports, 1927—Hampshire and Hardy counties.

County Reports, 1914—Kanawha County.

Alberta Scientific and Industrial Research Council: Eighth Annual Report of the, 1927.

Argentina, Ministerio de Agricultura de la: Publicacion No. 35—Datos Hidrologicos del Desierto de Atacama. Por Luciano R. Catalano.

Publicacion No. 36—Estatistica de Petroleo de la Republica Argentina durante el año 1927.

Australian Museum: Records of the, Vol. XVI, No. 5, No. 6.

Canada Department of Mines, Mines Branch: Silica in Canada, Its Occurrence, Exploitation and Uses, Part II, Western Canada. By L. Heber Cole.

Great Britain Department of Scientific and Industrial Research:

Memoirs of the Geological Survey, England. The Geology of the Country near Hastings and Dungeness. By H. J. Osborne White.

Wells and Springs of Somerset. By L. Richardson.

Summary of Progress of the Geological Survey of Great Britain and the Museum of Practical Geology for the Year 1927. Part I.

The Geology of the Country Around Woodbridge, Felixstowe and Orford.

Holland Leidsche Geologische Mededeelingen, Deel II—Aflevering 4.

Italian-Ministero Della Economia Nazionale, Rome: Relazione sul Servizio Minerario nel 1926.

Japan Geological Institute:

Some Carboniferous Fossils Collected in Manchuria and Korea. By Y. Ozawa.

The Ikuno-Akenobe Metallogenetic Province. By T. Kato.

Ordovician Fossils from Korea and South Manchuria. By T. Kobayashi.

The Optical Analysis of Volcanic Rocks as a Means of Studying Their Genetical Relationship. By S. Tsuboi.

Mexico, Instituto Geologico de:

Boletin Num. 47—Cefalopodos del Jurasico Medio de Oaxaca y Guerrero.

Mexico Secretaria de Industria, Comercio y Trabajo:

Boletin del Petroleo, Vol. XXV, Num. 1, Num. 2, Num. 3.

Boletin Minero, Tomo XXV, Num. 3, Num. 5.

New Zealand Geological Survey Branch:

Bulletins:

31—The Geology of the Tongaporutu-Ohura Subdivision, Taranaki Division.
By L. I. Grange.

32—Minerals and Mineral Substances of New Zealand. By P. G. Morgan.
Nova Scotia Department of Public Works and Mines:
Report on the Mines, 1927, Part I, Part II.

Nova Scotian Institute of Science:

The Proceedings and Transactions of the, Vol. XVI, Parts 1, 2, 3, 4.

Ontario Department of Mines:

Natural Gas in 1926 and Petroleum in 1926. By R. B. Harkness.
36th Annual Report, Vol. XXXVI, Parts I, II, III and IV.

Philippine Journal of Science, Vol. 35, No. 1, No. 4.

Rio de Janeiro Museu Nacional: Boletim, Vol. IV, No. 1.

Rio de Janeiro Biblioteca Nacional: Boletim Bibliographico Da, Anna IV, N. 1-2.
South Australia Department of Mines: Mining Review for the Half-Year Ended
December 31, 1927.

South Australia Geological Survey: Bulletin No. 13—Pigment Minerals in South
Australia. By R. Lockhart Jack.

Transvaal Chamber of Mines: Thirty-eighth Annual Report, Year 1927.

U. S. S. R. Scientific-Technical Department:

Transactions of the Institute of Economic Mineralogy and Metallurgy No. 34—
Research Work of the X-Ray Department.

No. 33—The Refractory Clays of the Ural. By M. O. Clerc.

No. 36—Wolchonskoite. By L. V. Pustovaloff.

No. 37—Petrographical Description of the Valley of Soimonovsk. By E. A.
Kouznetsov.

No. 38—On Some Rocks of Krivoi Rog and the Possibility of Their Application
in Industry. By V. V. Arshinov and B. J. Merenkov.

Societies and Educational Institutions

California, University of: Vol. 17, No. 6—Geomorphology of the Southwestern
San Gabriel Mountains of California. By William J. Miller.

No. 7—A Recent Volcanic Eruption Near Lassen Peak, California. By Howell
Williams.

No. 8—Geology of Blackhawk Canyon, San Bernardino Mountains, California.
By A. O. Woodford and T. F. Harriss.

Minnesota, University of: The Influence of Standardizing Agencies in Education.
By F. J. Kelly.

Nevada, The Mackay School of Mines: Vol. XXII, No. 2—Dumortierite.

Tohoku Imperial University, Sendai, Japan: The Science Reports of the, Vol.
IX, No. 3.

Academy of Natural Sciences of Pennsylvania, Year Book, 1927.

American Philosophical Society: Proceedings of the, Vol. LXVII, No. 1.

American Society of Mechanical Engineers, The: The Engineering Index, 1927.

American Bureau of Metal Statistics: Year Book of the, 1927.

American Geographical Society, The: The Geographical Review, Vol. XVII, 1927.
Vol. XVIII, No. 1.

Australian Museum, Records of the, Vol. XVI, No. 4.

California Academy of Sciences: Proceedings of the:

XXII—Descriptions of Two New Species of Fishes from off Cape San Lucas,
Lower California. By Barton Warren Evermann and H. Walton Clark.

XXIII—Report of the President of the Academy for the Year 1927. By C. E.
Grunsky.

XX—Notes on New or Rare Fishes from Hawaii. By David Starr Jordan,
Barton Warren Evermann and Shigeho Tanaka.

XVI—Index to Vol.

Occasional Papers of the, XIV—The Rudistids of Southern Mexico. By
Robert H. Palmer.

Canadian Institute of Mining and Metallurgy: The Canadian Mining and Metal-
lurgical Bulletin, Nos. 193, 194, 195.

Cleveland Museum of Natural History: The Status of the Great White Heron and Wurdemann's Heron. By Ernest G. Holt.

Engineers' Society of Western Pennsylvania: Proceedings of the, Vol. 43, No. 9; Vol. 44, No. 1, No. 2, No. 3, No. 4, No. 7.

Field Museum of Natural History: Publication 248, Vol. VII, No. 2—Annual Report of the Director for the Year 1927.

Illinois State Museum, 1877-1927 "Its Fifty Years of Service." By A. R. Crook.

Institution of Mining and Metallurgy, Bulletin of the, No. 282, No. 281.

Institution of Petroleum Technologists: Considerations on the Vapour-Phase Oxidation of Aromatic Hydrocarbons and of Petroleum Distillates.

Mining and Metallurgical Society of America: Bulletin 194—Résumé of the Minutes of the Executive Committee Meeting, April 25, 1928.

195—May-June, 1928.

San Diego Society of Natural History: Vol. V, No. 9—West Coast Species of Hinnites. By Hoyt Rodney Gale.

10—Notes on the Vaqueros and Temblor Formations of the California Miocene with Descriptions of New Species. By Lionel William Wiedey.

11—The Trimorphodon (Lyre Snake) of California, with Notes on the Species of the Adjacent Areas. By Laurence M. Klauber.

12—A New Echinoid from the California Eocene. By Hubert G. Schenck.

Western Society of Engineers: Journal of the, Vol. XXX, No. 10; Vol. XXXIII, Nos. 1, 2, 3, 4, 5, 6.

Maps

Ohio Geological Survey: Map Showing Mineral Industries of Ohio.

Virginia Geological Survey: Topographic Map of the State of Virginia.

Illinois State Geological Survey: Revised Edition of Geologic Map of Equality—Shawneetown Area.

Topographic Maps:

Albany, N. Y.

Berwyn, Ill.

Blossburg, Pa.

Carmel, N. Y.-Conn.

Chatsworth, Cal.

Claremont, Cal.

Covina, Cal.

Dry Canyon, Cal.

Gilbert, W. Va.-Va.-Ky.

Godley, Texas.

Indian Stream, N. H.-Vt.

La Brea, Cal.

La Verne, Cal.

Lemon Cove, Cal.

Liberty, Ill.

Los Angeles, Cal.

Memphis, Tenn.-Ark.

Meramec Spring, Mo.

Mount Rainier, Wash.

Mullens, W. Va.

Paxton, Ill.

Philippi, W. Va.

Pineville, W. Va.

Puente, Cal.

Puako, H. T.

Rochester, Mining District, Nev.

Topanga Canyon, Cal.

Wolfeboro, N. H.

Zelzah, Cal.

Zephyr, Texas.

Current Magazines on File

For the convenience of persons wishing to consult the technical magazines in the reading room, a list of those on file is appended:

American Petroleum Institute, New York.

Architect and Engineer, San Francisco.

Arizona Mining Journal, Phoenix, Arizona.

Asbestos, Philadelphia, Pennsylvania.

Brick and Clay Record, Chicago.

Bulletin, Union Oil Co., Los Angeles.

California Journal of Development, San Francisco.

Cement, Mill and Quarry, Chicago, Illinois.

Chemical-Engineering and Mining Review, Melbourne, Australia.

Engineering and Mining Journal, New York.

Explosives Engineer, Wilmington, Del.

Financial Insurance News, Los Angeles, California.

Graphite, Jersey City.

Journal of Electricity and Western Industry, San Francisco.

Metallurgical and Chemical Engineering, New York.
Mine and Quarry, Chicago.
Mining and Engineering Record, Vancouver, B. C.
Mining and Oil Bulletin, Los Angeles.
Oil Age, Los Angeles.
Oil and Gas Journal, Tulsa, Oklahoma.
Oil and Gas News, Kansas City.
Oil News, Galesburg, Illinois.
Oildom, New York.
Oil, Paint and Drug Reporter, New York.
Oil Trade Journal, New York.
Oil Weekly, Houston, Texas.
Petroleum Age, New York.
Petroleum Record, Los Angeles.
Petroleum World, Los Angeles.
Queensland Government Mining Journal, Brisbane, Australia.
Rock Products, Chicago, Illinois.
Safety News, Industrial Accident Commission, San Francisco.
Salt Lake Mining Review, Salt Lake City, Utah.
Southwest Builder and Contractor, Los Angeles.
Standard Oil Bulletin, San Francisco.
Stone, New York.
The Record, Associated Oil Company, San Francisco.
Through the Ages, Baltimore.
Underground, San Francisco.

Newspapers.

The following papers are received and kept on file in the library:

Amador Dispatch, Jackson, Cal.
Arkansas Oil and Mineral News, Hot Springs National Park (Arkansas).
Barstow Printer, Barstow, Cal.
Blythe Herald, Blythe, Cal.
Bridgeport Chronicle-Union, Bridgeport, Mono Co., Cal
Calaveras Prospect, San Andreas, Cal.
California Oil World, Los Angeles, Cal.
Cloverdale Reveille, Cloverdale, Cal.
Colusa Daily Sun, Colusa, Cal.
Daily Commercial News, San Francisco, Cal.
Daily Midway Driller, Taft, Cal.
Del Norte Triplicate, Crescent City, Cal.
Exeter Sun, Exeter, Cal.
Gateway Gazette, Beaumont, Cal.
Goldfield News, Goldfield, Nevada.
Guerneville Times, Guerneville, Cal.
Healdsburg Enterprise, Healdsburg, Cal.
Humboldt Standard, Eureka, Cal.
Inyo Independent, Independence, Cal.
Inyo Register, Bishop, Cal.
Ione Valley Echo, Ione, Cal.
Lake County Bee, Lakeport, Cal.
Mining and Financial Record, Denver, Colo.
Mountain Democrat, Placerville, Cal.
Mountain Messenger, Downieville, Cal.
Nevada Mining Press, Reno, Nevada.
Oatman Mining News, Oatman, Arizona.
Oregon Observer, Grants Pass, Oregon.
Oroville Daily Register, Oroville, Cal.
Petroleum Reporter, Taft, Cal.
Placer Herald, Auburn, Cal.
Plumas Independent, Quincy, Cal.
Plumas National Bulletin, Quincy, Cal.
Randsburg Times, Randsburg, Cal.
San Diego News, San Diego, Cal.
Shasta Courier, Redding, Cal.

Siskiyou News, Yreka, Cal.
Stockton Record, Stockton, Cal.
Tuolumne Prospector, Tuolumne, Cal.
Ventura Daily Post, Ventura, Cal.
Weekly Trinity Journal, Weaverville, Cal.
Western Sentinel, Etna Mills, Cal.



PRODUCERS AND CONSUMERS

The producer and consumer of mineral products are mutually dependent upon each other for their prosperity, and one of the most direct aids rendered by the Bureau to the mining industry in the past has been that of bringing producers and consumers into direct touch with each other.

This work has been carried on largely by correspondence, supplemented by personal consultation. Lists of buyers of all the commercial minerals produced in California have been made available to producers upon request, and likewise the owners of undeveloped deposits of various minerals, and producers of them, have been made known to those looking for raw mineral products.

When the publication of *MINING IN CALIFORNIA* was on a monthly basis, current inquiries from buyers and sellers were summarized and lists of mineral products or deposits 'wanted' or 'for sale' included in each issue.

It is important that inquiries of this nature reach the mining public as soon as possible and in order to avoid the delay incident to the present quarterly publication of *MINING IN CALIFORNIA*, these lists are now issued monthly in the form of a mimeographed sheet under the title of 'Commercial Mineral Notes,' and sent to those on the mailing list for *MINING IN CALIFORNIA*.

EMPLOYMENT SERVICE

Following the establishment of the Mining Division branch offices in 1919, a free technical employment service was offered as a mutual aid to mine operators and technical men for the general benefit of the mineral industry.

Briefly summarized, men desiring positions are registered, the cards containing an outline of the applicant's qualifications, position wanted, salary desired, etc., and as notices of 'positions open' are received, the names and addresses of all applicants deemed qualified are sent to the prospective employer for direct negotiations.

Telephone and telegraphic communications are also given immediate attention.

Technical men, or those qualified for supervisory positions, and vacancies of like nature, only are registered, as no attempt will be made to supply common mine and mill labor.

Registration cards for the use of both prospective employers and employees may be obtained upon request, and a cordial invitation is extended to the industry to make free use of the facilities afforded. Parties interested should communicate direct with our San Francisco office.

PUBLICATIONS OF THE DIVISION OF MINES AND MINING

During the past forty-eight years, in carrying out the provisions of the organic act creating the former California State Mining Bureau, there have been published many reports, bulletins and maps which go to make up a library of detailed information on the mineral industry of the state, a large part of which could not be duplicated from any other source.

One feature that has added to the popularity of the publications is that many of them have been distributed without cost to the public, and even the more elaborate ones have been sold at a price which barely covers the cost of printing.

Owing to the fact that funds for the advancing of the work of this department have often been limited, many of the reports and bulletins mentioned were printed in limited editions which are now entirely exhausted.

Copies of such publications are available, however, in the office of the Division of Mines and Mining, in the Ferry Building, San Francisco; New Orpheum Building, Los Angeles; Capitol Extension Building, Sacramento; Redding; Santa Maria; Santa Paula; Coalinga; Taft; Bakersfield. They may also be found in many public, private and technical libraries in California and other states, and foreign countries.

A catalog of all publications from 1880 to 1917, giving a synopsis of their contents, is issued as Bulletin No. 77.

Publications in stock may be obtained by addressing any of the above offices and enclosing the requisite amount in the case of publications that have a list price. Only coin, stamps or money orders should be sent, and it will be appreciated if remittance is made in this manner rather than by personal check.

The prices noted include delivery charges to all parts of the United States. Money orders should be made payable to the Division of Mines and Mining.

REPORTS

Asterisks (**) indicate the publication is out of print.

	Price
**First Annual Report of the State Mineralogist, 1880, 43 pp. Henry G. Hanks -----	
**Second Annual Report of the State Mineralogist, 1882, 514 pp., 4 illustrations, 1 map. Henry G. Hanks-----	
**Third Annual Report of the State Mineralogist, 1883, 111 pp., 21 illustrations. Henry G. Hanks-----	
**Fourth Annual Report of the State Mineralogist, 1884, 410 pp., 7 illustrations. Henry G. Hanks-----	
**Fifth Annual Report of the State Mineralogist, 1885, 234 pp., 15 illustrations, 1 geological map. Henry G. Hanks-----	
**Sixth Annual Report of the State Mineralogist, Part I, 1886, 145 pp., 3 illustrations, 1 map. Henry G. Hanks-----	
**Part II, 1887, 222 pp., 36 illustrations. William Ireland, Jr.-----	
**Seventh Annual Report of the State Mineralogist, 1887, 315 pp. William Ireland, Jr.-----	
**Eighth Annual Report of the State Mineralogist, 1888, 948 pp., 122 illustrations. William Ireland, Jr.-----	
**Ninth Annual Report of the State Mineralogist, 1889, 352 pp., 57 illustrations, 2 maps. William Ireland, Jr.-----	
**Tenth Annual Report of the State Mineralogist, 1890, 983 pp., 179 illustrations, 10 maps. William Ireland, Jr.-----	

REPORTS—Continued

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Eleventh Report (First Biennial) of the State Mineralogist, for the two years ending September 15, 1892, 612 pp., 73 illustrations, 4 maps. William Irelan, Jr.	\$1.00
**Twelfth Report (Second Biennial) of the State Mineralogist, for the two years ending September 15, 1894, 541 pp., 101 illustrations, 5 maps. J. J. Crawford	
**Thirteenth Report (Third Biennial) of the State Mineralogist, for the two years ending September 15, 1896, 726 pp., 93 illustrations, 1 map. J. J. Crawford	
Chapters of the State Mineralogist's Report, Biennial Period, 1913–1914, Fletcher Hamilton:	
**Mines and Mineral Resources, Amador, Calaveras and Tuolumne Counties, 172 pp., paper	
Mines and Mineral Resources, Colusa, Glenn, Lake, Marin, Napa, Solano, Sonoma and Yolo Counties, 208 pp., paper	.50
Mines and Mineral Resources, Del Norte, Humboldt, and Mendocino Counties, 59 pp., paper	.25
**Mines and Mineral Resources, Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin and Stanislaus Counties, 220 pages, paper	
Mines and Mineral Resources of Imperial and San Diego Counties, 113 pp., paper	.35
**Mines and Mineral Resources, Shasta, Siskiyou and Trinity Counties, 180 pp., paper	
**Fourteenth Report of the State Mineralogist, for the Biennial Period 1913–1914, Fletcher Hamilton, 1915:	
A General Report on the Mines and Mineral Resources of Amador, Calaveras, Tuolumne, Colusa, Glenn, Lake, Marin, Napa, Solano, Sonoma, Yolo, Del Norte, Humboldt, Mendocino, Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin, Stanislaus, San Diego, Imperial, Shasta, Siskiyou, and Trinity Counties, 974 pp., 275 illustrations, cloth	
Chapters of the State Mineralogist's Report, Biennial Period, 1915–1916, Fletcher Hamilton:	
**Mines and Mineral Resources, Alpine, Inyo and Mono Counties, 176 pp., paper	
**Mines and Mineral Resources, Butte, Lassen, Modoc, Sutter, and Tehama Counties, 91 pp., paper	
Mines and Mineral Resources, El Dorado, Placer, Sacramento, and Yuba Counties, 198 pp., paper	.65
Mines and Mineral Resources, Monterey, San Benito, San Luis Obispo, Santa Barbara, and Ventura Counties, 183 pp., paper	.65
Mines and Mineral Resources, Los Angeles, Orange, and Riverside Counties, 136 pp., paper	.50
**Mines and Mineral Resources, San Bernardino and Tulare Counties, 186 pp., paper	
**Fifteenth Report of the State Mineralogist, for the Biennial Period 1915–1916, Fletcher Hamilton, 1917:	
A General Report on the Mines and Mineral Resources of Alpine, Inyo, Mono, Butte, Lassen, Modoc, Sutter, Tehama, Placer, Sacramento, Yuba, Los Angeles, Orange, Riverside, San Benito, San Luis Obispo, Santa Barbara, Ventura, San Bernardino and Tulare Counties, 990 pp., 413 illustrations, cloth	
Chapters of the State Mineralogist's Report, Biennial Period 1917–1918, Fletcher Hamilton:	
Mines and Mineral Resources of Nevada County, 270 pp., paper	.75
Mines and Mineral Resources of Plumas County, 188 pp., paper	.50
Mines and Mineral Resources of Sierra County, 144 pp., paper	.50
Seventeenth Report of the State Mineralogist, 1920, Mining in California during 1920, Fletcher Hamilton: 562 pp., 71 illustrations, cloth	
Eighteenth Report of the State Mineralogist, 1922, Mining in California, Fletcher Hamilton. Chapters published monthly beginning with January, 1922:	1.75

REPORTS—Continued

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**January, **February, March, April, May, June, July, August, September, October, November, December, 1922	Free
Chapters of Nineteenth Report of the State Mineralogist, 'Mining in California,' Fletcher Hamilton and Lloyd L. Root. January, February, March, September, 1923	Free
Chapters of Twentieth Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly. January, April, **July, October, 1924, per copy	\$0.25
Chapters of Twenty-first Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly.	
January, 1925, Mines and Mineral Resources of Sacramento, Monterey and Orange counties	.25
April, 1925, Mines and Mineral Resources of Calaveras, Merced, San Joaquin, Stanislaus and Ventura counties	.25
July, 1925, Mines and Mineral Resources of Del Norte, Humboldt and San Diego counties	.25
October, 1925, Mines and Mineral Resources of Siskiyou, San Luis Obispo and Santa Barbara counties	.25
Subscription, \$1.00 in advance (by calendar year, only).	
Chapters of Twenty-second Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly.	
January, 1926, Mines and Mineral Resources of Trinity and Santa Cruz counties	.25
April, 1926, Mines and Mineral Resources of Shasta, San Benito and Imperial counties	.25
July, 1926, Mines and Mineral Resources of Marin and Sonoma Counties	.25
October, 1926, Mines and Mineral Resources of El Dorado and Inyo counties, also report on Minaret District, Madera County	.25
Chapters of Twenty-third Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly.	
January, 1927, Mines and Mineral Resources of Contra Costa County; Santa Catalina Island	.25
April, 1927, Mines and Mineral Resources of Amador and Solano counties	.25
July, 1927, Mines and Mineral Resources of Placer and Los Angeles counties	.25
October, 1927, Mines and Mineral Resources of Mono County	.25
Chapters of Twenty-fourth Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly.	
January, 1928, Mines and Mineral Resources of Tuolumne County	.25
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Chapters of State Oil and Gas Supervisor's Report:	
Summary of Operations—California Oil Fields, July, 1918, to March, 1919 (one volume)	Free
Summary of Operations—California Oil Fields. Published monthly, beginning April, 1919:	
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BULLETINS

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**Bulletin No. 3. Gas and Petroleum Yielding Formations of Central Valley of California, by W. L. Watts. 1894, 100 pp., 13 illustrations. 4 maps	-----
**Bulletin No. 4. Catalogue of Californian Fossils, by J. G. Cooper, 1894, 73 pp., 67 illustrations. (Part I was published in the Seventh Annual Report of the State Mineralogist, 1887.)	-----
**Bulletin No. 5. The Cyanide Process, 1894. by Dr. A. Scheidel. 140 pp., 46 illustrations	-----
Bulletin No. 6. California Gold Mill Practices, 1895, by E. B. Preston. 85 pp., 46 illustrations	-----
**Bulletin No. 7. Mineral Production of California, by Counties for the year 1894, by Charles G. Yale. Tabulated sheet	\$0.50
**Bulletin No. 8. Mineral Production of California, by Counties for the year 1895, by Charles G. Yale. Tabulated sheet	-----
**Bulletin No. 9. Mine Drainage, Pumps, etc., by Hans C. Behr. 1896, 210 pp., 206 illustrations	-----
**Bulletin No. 10. A bibliography Relating to the Geology, Palaeontology and Mineral Resources of California, by Anthony W. Vogdes. 1896, 121 pp.	-----
**Bulletin No. 11. Oil and Gas Yielding Formations of Los Angeles, Ventura and Santa Barbara counties, by W. L. Watts. 1897, 94 pp., 6 maps, 31 illustrations	-----
**Bulletin No. 12. Mineral Production of California, by Counties for 1896, by Charles G. Yale. Tabulated sheet	-----
**Bulletin No. 13. Mineral Production of California, by Counties for 1897, by Charles G. Yale. Tabulated sheet	-----
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**Bulletin No. 15. Map of Oil City Fields, Fresno County, by John H. Means. 1899	-----
**Bulletin No. 16. The Genesis of Petroleum and Asphaltum in California, by A. S. Cooper. 1899, 39 pp., 29 illustrations	-----
**Bulletin No. 17. Mineral Production of California, by Counties for 1899, by Charles G. Yale. Tabulated sheet	-----
**Bulletin No. 18. Mother Lode Region of California, by W. H. Storms. 1900, 154 pp., 49 illustrations	-----
**Bulletin No. 19. Oil and Gas Yielding Formations of California, by W. L. Watts. 1900, 236 pp., 60 illustrations, 8 maps	-----
**Bulletin No. 20. Synopsis of General Report of State Mining Bureau, by W. L. Watts. 1901, 21 pp. This bulletin contains a brief statement of the progress of the mineral industry in California for the four years ending December, 1899	-----
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**Bulletin No. 28. Mineral Production of California, for 1902, by Charles G. Yale. Tabulated sheet	-----
**Bulletin No. 29. Mineral Production of California for Sixteen Years, by Charles G. Yale. 1903. Tabulated sheet	-----

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**Bulletin No. 31. Chemical Analyses of California Petroleum, by H. N. Cooper. 1904. Tabulated sheet	-----
**Bulletin No. 32. Production and Use of Petroleum in California, by Paul W. Prutzman. 1904, 230 pp., 116 illustrations, 14 maps	-----
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**Bulletin No. 39. Mineral Production of California, by Counties, for 1904, by Charles G. Yale. Tabulated sheet	-----
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Bulletin No. 46. General Index of Publications of the California State Mining Bureau, by Charles G. Yale. 1907, 54 pp.	\$0.30
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**Bulletin No. 49. Mines and Minerals of California for 1906, by Charles G. Yale. 34 pp.	-----
Bulletin No. 50. The Copper Resources of California, 1908, by A. Hausmann, J. Kruttschnitt, Jr., W. E. Thorne and J. A. Edman, 366 pp., 74 illustrations. (Revised edition.)	1.00
**Bulletin No. 51. Mineral Production of California, by Counties, 1907, by D. H. Walker. Tabulated sheet	-----
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**Bulletin No. 58. Mineral Production of California, by Counties, by D. H. Walker, 1909. Tabulated sheet	-----
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**Bulletin No. 62. Mineral Production of California for Twenty-four Years, by D. H. Walker. 1910. Tabulated sheet.	
**Bulletin No. 63. Petroleum in Southern California, by P. W. Prutzman. 1912, 430 pp., 41 illustrations, 6 maps.	
**Bulletin No. 64. Mineral Production for 1911, by E. S. Boalich. 49 pp.	
**Bulletin No. 65. Mineral Production for 1912, by E. S. Boalich. 64 pp.	
**Bulletin No. 66. Mining Laws of the United States and California. 1914, 89 pp.	
**Bulletin No. 67. Minerals of California, by Arthur S. Eakle. 1914, 226 pp.	
**Bulletin No. 68. Mineral Production for 1913, with County Maps and Mining Laws, by E. S. Boalich. 160 pp.	
**Bulletin No. 69. Petroleum Industry of California, with Folio of Maps (18 by 22), by R. P. McLaughlin and C. A. Waring. 1914, 519 pp., 13 illustrations, 83 figs. [18 plates in accompanying folio.]	
**Bulletin No. 70. Mineral Production for 1914, with County Maps and Mining Laws. 184 pp.	
**Bulletin No. 71. Mineral Production for 1915, with County Maps and Mining Laws, by Walter W. Bradley. 193 pp., 4 illustrations.	
Bulletin No. 72. The Geologic Formations of California, by James Perrin Smith. 1916, 47 pp.	
**Reconnaissance Geologic Map (of which Bulletin 72 is explanatory), in 23 colors. Scale: 1 inch = 12 miles. Mounted.	\$0.25
**Bulletin No. 73. First Annual Report of the State Oil and Gas Supervisor of California, for the fiscal year 1915–16, by R. P. McLaughlin. 278 pp., 26 illustrations.	
Bulletin No. 74. Mineral Production of California in 1916, with County Maps, by Walter W. Bradley. 179 pp., 12 illustrations.	
**Bulletin No. 75. United States and California Mining Laws, 1917. 115 pp., paper.	Free
Bulletin No. 76. Manganese and Chromium in California, by Walter W. Bradley, Emile Huguenin, C. A. Logan, W. B. Tucker and C. A. Waring, 1918. 248 pp., 51 illustrations, 5 maps, paper.	.50
Bulletin No. 77. Catalogue of Publications of California State Mining Bureau, 1880–1917, by E. S. Boalich. 44 pp., paper.	Free
Bulletin No. 78. Quicksilver Resources of California, with a Section on Metallurgy and Ore-Dressing, by Walter W. Bradley, 1918. 389 pp., 77 photographs and 42 plates (colored and line cuts), cloth.	1.50
Bulletin No. 79. Magnesite in California, by Walter W. Bradley, 1925, 147 pp., 62 photographs, 11 line cuts and maps, cloth.	1.00
†Bulletin No. 80. Tungsten, Molybdenum and Vanadium in California. (In preparation.)	
†Bulletin No. 81. Foothill Copper Belt of California. (In preparation)	
**Bulletin No. 82. Second Annual Report of the State Oil and Gas Supervisor, for the fiscal year 1916–1917, by R. P. McLaughlin, 1918. 412 pp., 31 illustrations, cloth.	
Bulletin No. 83. California Mineral Production for 1917, with County Maps, by Walter W. Bradley. 179 pp., paper.	Free
**Bulletin No. 84. Third Annual Report of the State Oil and Gas Supervisor, for the fiscal year 1917–1918, by R. P. McLaughlin, 1918. 617 pp., 28 illustrations, cloth.	
**Bulletin No. 85. Platinum and Allied Metals in California, by C. A. Logan, 1919. 10 photographs, 4 plates, 120 pp., paper.	
Bulletin No. 86. California Mineral Production for 1918, with County Maps, by Walter W. Bradley, 1919. 212 pp., paper.	Free

† Not yet published.

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Bulletin No. 88. California Mineral Production for 1919, with County Maps, by Walter W. Bradley, 1920. 204 pp., paper-----	Free
**Bulletin No. 89. Petroleum Resources of California, with Special Reference to Unproved Areas, by Lawrence Vander Leck, 1921. 12 figures, 6 photographs, 6 maps in pocket, 186 pp., cloth-----	
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Bulletin No. 91. Minerals of California, by Arthur S. Eakle, 1923. 328 pp., cloth-----	\$1.00
Bulletin No. 92. Gold Placers of California, by Chas. S. Haley, 1923. 167 pp., 36 photographs and 7 plates (colored and line cuts, also geologic map), cloth-----	1.50 .50
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Bulletin No. 93. California Mineral Production for 1922, by Walter W. Bradley, 1923, 188 pp., paper-----	Free
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**Bulletin No. 96. California Mineral Production for 1924, by Walter W. Bradley, 1925. 173 pp., paper-----	
Bulletin No. 97. California Mineral Production for 1925, by Walter W. Bradley, 1926. 172 pp., paper-----	Free
Bulletin No. 99. Clay Resources and Ceramic Industry of California by Waldemar Fenn Dietrich, 1928. 383 pp., 70 photos, 12 line cuts including maps, cloth-----	1.50
Bulletin No. 100. California Mineral Production for 1926, by Walter W. Bradley, 1927. 174 pp., paper-----	Free

PRELIMINARY REPORTS

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**Preliminary Report No. 1. Notes on Damage by Water in California Oil Fields, December, 1913. By R. P. McLaughlin. 4 pp.-----	
**Preliminary Report No. 2. Notes on Damage by Water in California Oil Fields, March, 1914. By R. P. McLaughlin. 4 pp.-----	
Preliminary Report No. 3. Manganese and Chromium, 1917. By E. S. Boalich. 32 pp.-----	Free
Preliminary Report No. 4. Tungsten, Molybdenum and Vanadium. By E. S. Boalich and W. O. Castello, 1918. 34 pp. Paper-----	Free
Preliminary Report No. 5. Antimony, Graphite, Nickel, Potash, Strontium and Tin. By E. S. Boalich and W. O. Castello, 1918. 44 pp. Paper-----	Free
**Preliminary Report No. 6. A Review of Mining in California During 1915. Fletcher Hamilton, 1920. 43 pp. Paper-----	
**Preliminary Report No. 7. The Clay Industry in California. By E. S. Boalich, W. O. Castello, E. Huguenin, C. A. Logan, and W. B. Tucker, 1920. 102 pp. 24 illustrations. Paper-----	
**Preliminary Report No. 8. A Review of Mining in California During 1921, with Notes on the Outlook for 1922. Fletcher Hamilton, 1922. 68 pp. Paper-----	

MISCELLANEOUS PUBLICATIONS

Asterisks (**) indicate the publication is out of print.

**First Annual Catalogue of the State Museum of California, being the collection made by the State Mining Bureau during the year ending April 16, 1881. 350 pp.-----	
**Catalogue of books, maps, lithographs, photographs, etc., in the library of the State Mining Bureau at San Francisco, May 15, 1884. 19 pp.-----	

MISCELLANEOUS PUBLICATIONS—Continued

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**Catalogue of the State Museum of California, Volume II, being the collection made by the State Mining Bureau from April 16, 1881, to May 5, 1884. 220 pp.	
**Catalogue of the State Museum of California, Volume III, being the collection made by the State Mining Bureau from May 15, 1884, to March 31, 1887. 195 pp.	
**Catalogue of the State Museum of California, Volume IV, being the collection made by the State Mining Bureau from March 30, 1887, to August 20, 1890. 261 pp.	
**Catalogue of the Library of the California State Mining Bureau, September 1, 1892. 149 pp.	
**Catalogue of West North American and Many Foreign Shells with Their Geographical Ranges, by J. G. Cooper. Printed for the State Mining Bureau, April, 1894.	
**Report of the Board of Trustees for the four years ending September, 1900. 15 pp. Paper	
Bulletin. Reconnaissance of the Colorado Desert Mining District. By Stephen Bowers, 1901. 19 pp. 2 illustrations. Paper	
Commercial Mineral Notes. A monthly mimeographed sheet, beginning April, 1923	Free

MAPS**Register of Mines With Maps.**

Asterisks (**) indicate out of print.

**Register of Mines, with Map, Amador County	
**Register of Mines, with Map, Butte County	
**Register of Mines, with Map, Calaveras County	
**Register of Mines, with Map, El Dorado County	
**Register of Mines, with Map, Inyo County	
**Register of Mines, with Map, Kern County	
**Register of Mines, with Map, Lake County	
**Register of Mines, with Map, Mariposa County	
**Register of Mines, with Map, Nevada County	
**Register of Mines, with Map, Placer County	
**Register of Mines, with Map, Plumas County	
**Register of Mines, with Map, San Bernardino County	
**Register of Mines, with Map, San Diego County	
Register of Mines, with Map, Santa Barbara County (1906)	\$0.25
**Register of Mines, with Map, Shasta County	
**Register of Mines, with Map, Sierra County	
**Register of Mines, with Map, Siskiyou County	
**Register of Mines, with Map, Trinity County	
**Register of Mines, with Map, Tuolumne County	
Register of Mines, with Map, Yuba County (1905)	.25
Register of Oil Wells, with Map, Los Angeles City (1906)	.35

OTHER MAPS

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**Map of California, Showing Mineral Deposits (50 x 60 in.)	
**Map of Forest Reserves in California	
**Mineral and Relief Map of California	
**Map of El Dorado County, Showing Boundaries, National Forests	
**Map of Madera County, Showing Boundaries, National Forests	
**Map of Placer County, Showing Boundaries, National Forests	
**Map of Shasta County, Showing Boundaries, National Forests	
**Map of Sierra County, Showing Boundaries, National Forests	
**Map of Siskiyou County, Showing Boundaries, National Forests	
**Map of Tuolumne County, Showing Boundaries, National Forests	
**Map of Mother Lode Region	
**Map of Desert Region of Southern California	
Map of Minaret District, Madera County	.20
Map of Copper Deposits in California	.05
**Map of Calaveras County	
**Map of Plumas County	
**Map of Trinity County	

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**Map of Tuolumne County-----	\$0.60
Geological Map of Inyo County. Scale 1 inch equals 4 miles-----	.25
Map of California accompanying Bulletin No. 89, showing generalized classification of land with regard to oil possibilities. Map only, without Bulletin-----	.25
**Geological Map of California, 1916. Scale 1 inch equals 12 miles. As accurate and up-to-date as available data will permit as regards topography and geography. Shows railroads, highways, post offices and other towns. First geological map that has been available since 1892, and shows geology of entire state as no other map does. Geological details lithographed in 23 colors. Mounted-----	----
Topographic Map of Sierra Nevada Gold Belt, showing distribution of auriferous gravels, accompanying Bulletin No. 92 (also sold singly) In 4 colors-----	.50

OIL FIELD MAPS

These maps are revised from time to time as development work advances and ownerships change.

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Map No. 8—South Midway and Buena Vista Hills, Kern County-----	.75
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DETERMINATION OF MINERAL SAMPLES

Samples (limited to three at one time) of any mineral found in the state may be sent to the Division of Mines and Mining for identification, and the same will be classified free of charge. No samples will be determined if received from points outside the state. It must be understood that no assays, or quantitative determinations will be made. Samples should be in lump form if possible, and marked plainly with name of sender on outside of package, etc. No samples will be received unless delivery charges are prepaid. A letter should accompany sample, giving locality where mineral was found and the nature of the information desired.

STATE OF CALIFORNIA
DIVISION OF MINES AND MINING

CORDIALLY INVITES YOU TO VISIT
ITS VARIOUS DEPARTMENTS MAINTAINED
FOR THE PURPOSE OF FURTHERING
THE DEVELOPMENT OF THE

MINERAL RESOURCES OF CALI-
FORNIA

At the service of the public are the scientific reference library and reading room, the general information bureau, the laboratory for the free determination of mineral samples found in the state, and the largest museum of mineral specimens on the Pacific Coast. The time and attention of the State Mineralogist, as well as that of his technical staff, are also at your disposal.

Office hours: 9 a.m. to 5 p.m. daily.

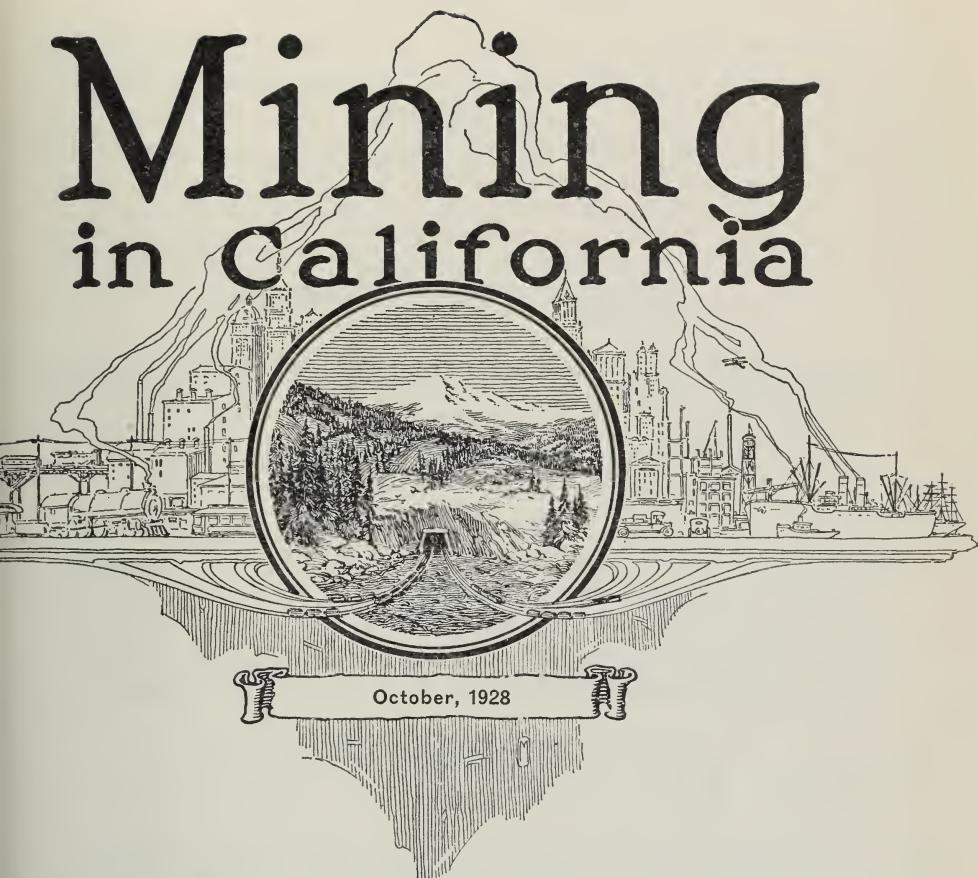
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LLOYD L. ROOT,

Third floor, Ferry Building, San Francisco, Cal.

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Mining in California



PUBLISHED QUARTERLY

STATE OF CALIFORNIA
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FERRY BUILDING
SAN FRANCISCO

DIVISION OF MINES AND MINING

EXECUTIVE AND TECHNICAL STAFF

WALTER W. BRADLEY

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R. D. BUSH, State Oil and Gas Supervisor	- - - - -	San Francisco
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NOTE.—A detailed report of the activities of the Department of Petroleum and Gas is issued monthly by the Division of Mines and Mining, entitled 'Summary of Operations, California Oil Fields.'

STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINES AND MINING
FERRY BUILDING, SAN FRANCISCO

WALTER W. BRADLEY

State Mineralogist

Vol. 24

OCTOBER 1928

No. 4

CHAPTER OF
REPORT XXIV OF THE STATE
MINERALOGIST

COVERING

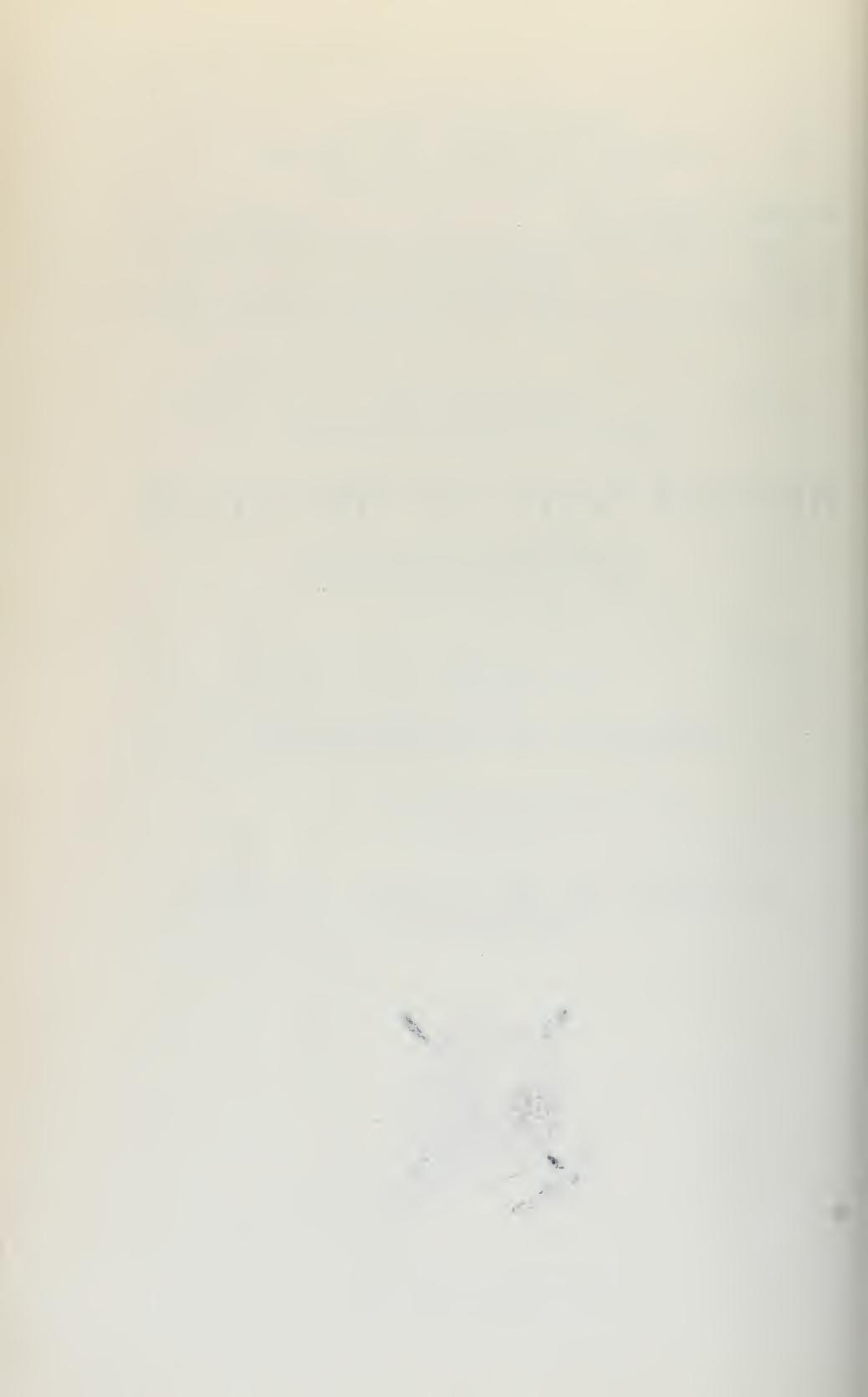
MINING IN CALIFORNIA

AND THE

**ACTIVITIES OF THE DIVISION OF MINES
AND MINING**



CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO, 1929



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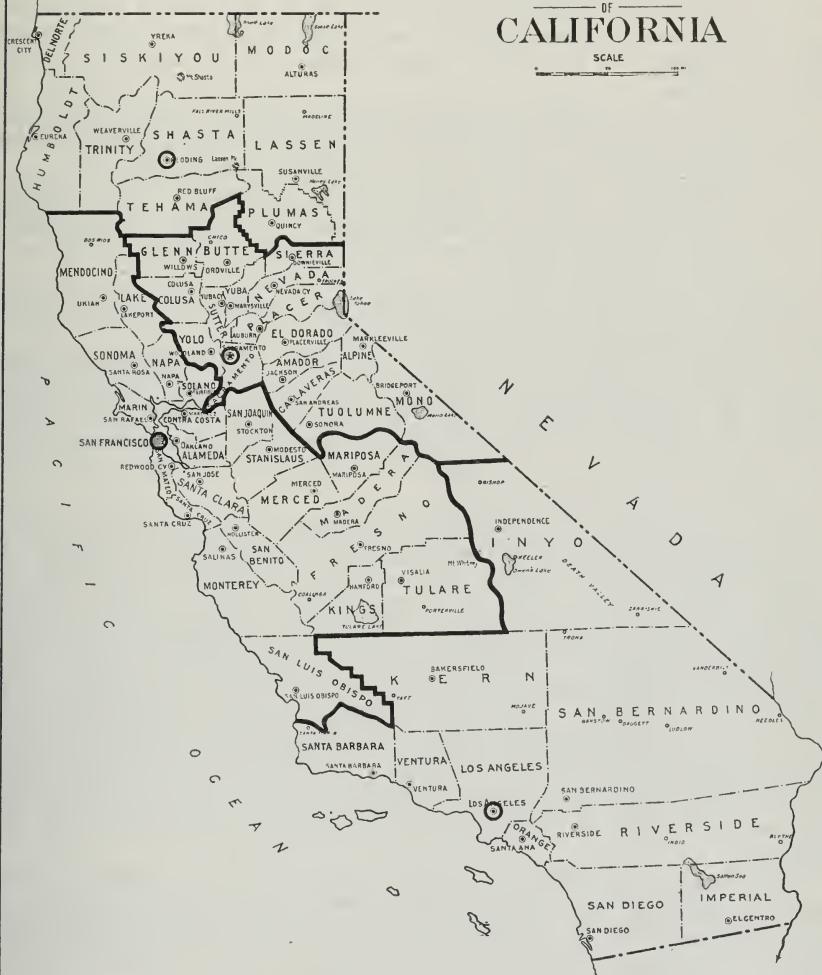
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State of California
DIVISION OF MINES AND MINING
WALTER W. BRADLEY

STATE MINERALOGIST

OUTLINE MAP
OF
CALIFORNIA

SCALE



•LEGEND•

- Mining Division Boundaries.
- Mining Division Offices.

MEXICO

PREFACE

The Division of Mines and Mining (formerly State Mining Bureau) is maintained for the purpose of assisting in all possible ways in the development of California's mineral resources.

As one means of offering tangible service to the mining public, the State Mineralogist for many years has issued an annual or a biennial report reviewing in detail the mines and mineral deposits of the various counties.

The weak point in work of this character has been that the results of field investigations were so long in preparation that they had lost much of their usefulness by the time they finally appeared in print.

As a progressive step in advancing the interests of the mineral industry, publication of the Annual Report of the State Mineralogist in the form of monthly chapters was begun in January, 1922, and continued until March, 1923.

Owing to a lack of funds for printing this was changed to quarterly publication, beginning in September, 1923.

For the same reason, beginning with the January, 1924, issue, it has been necessary to charge a subscription price of \$1 per calendar year, payable in advance; single copies, 25 cents apiece. 'Mining in California' will continue to be sent without charge to our exchange list, including schools and public libraries, as are also other publications of the Division of Mines and Mining.

Pages are numbered consecutively throughout the year and an index to the complete reports is included annually in the closing number.

Such a publication admits of several improvements over the old method of procedure. Each issue contains a report of the current development and mining activities of the state, prepared by the district mining engineers. Special articles dealing with various phases of mining and allied subjects by members of the staff and other contributors are included. Mineral production reports formerly issued only as an annual statistical bulletin are published herein as soon as returns from producers are compiled. The executive activities, and those of the laboratory, museum, library, employment service and other features with which the public has had too little acquaintance also are reported.

While current activities of all descriptions will be covered in these chapters, the practice of issuing from time to time technical reports on special subjects will be continued, as well. A list of such reports now available is appended hereto, and the names of new bulletins will be added in the future as they are completed.

The chapters will be subject to revision, correction and improvement. Constructive suggestions from the mining public will be gladly received, and are invited.

The one aim of the Division of Mines and Mining is to increase its usefulness and to stimulate the intelligent development of the wonderful, latent resources of the State of California.

DISTRICT REPORTS OF MINING ENGINEERS

In 1919-1920 the Mining Department was organized into four main geographical divisions, with the field work delegated to a mining engineer in each district, working out from field offices that were established in Redding, Auburn, San Francisco and Los Angeles, respectively. This move brought the office into closer personal contact with operators, and it has many advantages over former methods of conducting field work. In 1923 the Redding and Auburn field offices were consolidated and moved to Sacramento.

The Redding office was reestablished in 1928, and the boundaries of each district adjusted. The counties now included in each of the four divisions, and the locations of the branch offices, are shown on the accompanying outline map of the state. (Frontispiece.)

Reports of mining activities and development in each division, prepared by the district engineer, will continue to appear under the proper field division heading.

Although the petroleum industry is but little affiliated with other branches of mining, oil and gas are among the most valuable mineral products of California, and a report by the State Oil and Gas Supervisor on the current development and general conditions in the state's oil fields is included under this heading.

New County Reports.

The series of separate reports on the mines and mineral resources of the different counties, that together comprise the State Mineralogist's Reports XIV to XVII, inclusive, in the case of many of the counties have become exhausted. Those still in stock are in need of revision. It was deemed advisable, therefore, beginning with the January, 1925, issue of 'Mining in California,' to make the district engineers' reports in the form of a complete general report on the mines and mineral resources in one or more of the counties in each district.

This program will be followed as near as possible in succeeding numbers of the quarterly until each county in the state has been covered.

SACRAMENTO FIELD DIVISION

C. A. LOGAN, Mining Engineer

On account of unfinished field work there is no report from the Sacramento Field Division in this issue.

REDDING FIELD DIVISION

CHAS. VOLNEY AVERILL, Mining Engineer

PLUMAS COUNTY

Introduction.

Plumas County received its name from the original name of the Feather River, Rio de Las Plumas, which had been named in 1820, by Don Luis Arguello, who is said to have observed countless bright feathers of waterfowl floating on its surface. Very little attention was paid to this region until 1850, at which time it was a portion of Butte

County. Miners then entered it to search for a lake known as Gold Lake, and reported to be fabulously rich in gold. The lake was never found, but the prospecting resulted in the discovery of many rich deposits of placer gold.



Indian Valley from Standart Mine.

Geography.

Plumas County is located in the northeastern portion of the state just to the south of Lassen County and north of Sierra County. The state of Nevada almost touches it on the east, but a jutting strip of Lassen County only a few miles wide intervenes. The shape of the county, as it appears on a map, is that of a camel at rest, head up, and facing the west. This peculiar shape results from following the divides between streams with the boundary lines. The entire county is drained by Feather River and its branches, and the boundaries are such that practically no drainage flows into any other stream than the Feather.

Northern California is a region of mountains that belong to three different ranges, the Coast Range, including the Klamath Mountains, the Cascade Range and the Sierra Nevada. Plumas County lies at the extreme northern end of the Sierra Nevada, but touches the volcanic Cascade Range to the north near Lassen Peak, and is bordered on the east by the Great Basin. Fifty miles to the west is the Great Valley of California (the Sacramento), to which flow the waters of the melting snows of the northern Sierra Nevada by way of the picturesque Feather River.

Quincy, the county seat, located in American Valley, is a town of 1800 people. The total population of the county by the 1920 census was 5681. The area of the county is 2594 square miles or 1,660,000 acres, of which 865,000 acres of timber land are reserved by the United States government, and 251,000 acres of timberland are privately owned. Tillable land amounts to 120,900 acres. The average annual precipitation is 41.57 inches of water which falls almost entirely as winter snow.

Topography.

The outstanding feature of Plumas County is its high relief; steep river canyons, which have been cut several thousand feet deep by swift streams, are the rule, and mountain peaks abound. The various forks of Feather River have cut the entire southern and western portions of the county into deep canyons with high ridges, and the result is a region of difficult accessibility. However, many fertile valleys lie in these forest-covered mountains; the largest is Indian Valley in the north-central portion, and others of importance are American, Genesee, Mohawk, and Sierra valleys. To the north, Lake Almanor, an artificial lake occupying what was formerly known as Big Meadows, is a prominent feature of the topography. To the south are many smaller mountain lakes. American, Indian and Genesee valleys are at elevations of 3500 to 3700 feet, while Sierra Valley is at 5000 feet. The ridges and peaks are generally at elevations of 6000 to nearly 8000 feet, while the North Fork Feather River canyon to the west has been cut down to an elevation of only 1500 feet.¹

This combination of mountains, forest, swift streams and mountain lakes makes a region very attractive to the fisherman, hunter and vacationist. The residents are encouraging these people to go into Plumas County; and many summer resorts, camps and summer homes are being built there.

Timber.

Forests of very fine timber cover practically the whole of Plumas County; and even though two-thirds of its area is forest reserve,



Genesee Valley from Cooper Mine.

extensive lumbering operations are being conducted on privately owned land. The largest are those of the Red River Lumber Company at Westwood, but other large mills are in operation at Quincy and at

¹ U. S. Geol. Survey Topographical Sheets: Downieville, Bidwell Bar, Sierraville, Honey Lake, Lassen Peak and Indian Valley Special.

various points along the Western Pacific Railroad. The annual cut is reported as approximately 87 million board feet. Much of this is Douglas fir, which makes excellent mining timber.



Mountains west of Greenville, Lake Almanor in the distance.

Transportation.

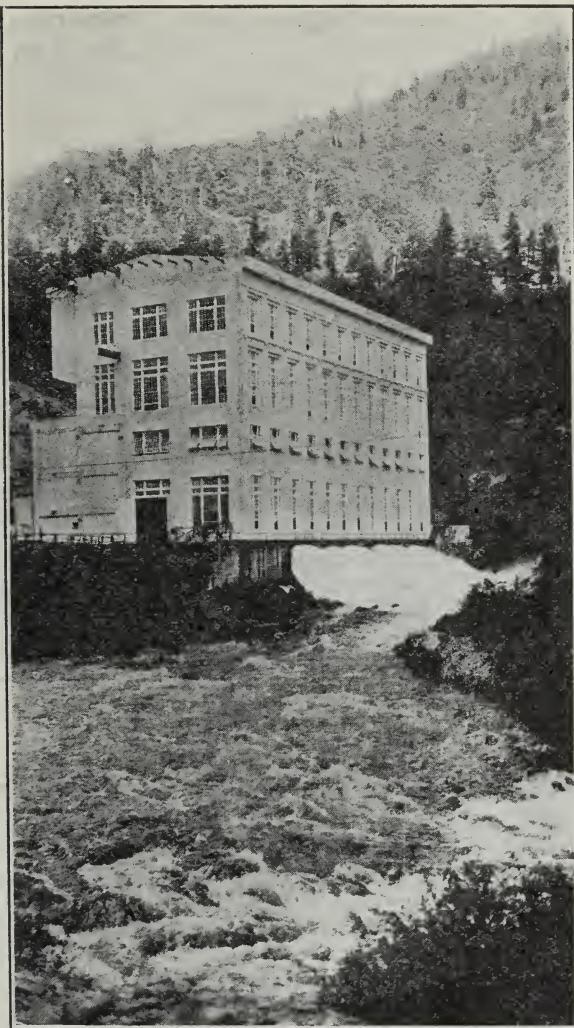
The main line of the Western Pacific Railroad runs practically through the center of the county, following the canyon of the North Fork of Feather River on a roadbed cut largely from the solid rock of the canyon walls, and crossing the Sierra Nevada at an easy grade, said not to exceed one per cent. This road requires no snowsheds; and for many years past it has not even been necessary to plow snow from the tracks. The Indian Valley Railroad connects with the Western Pacific at Paxton, and extends through Indian Valley to the copper mines at Engelmire. Logging roads from Chester and Westwood with outlet at Susanville in Lassen County, and from Red Clover Valley to Loyalton in Sierra County, complete the railroad facilities.

Negotiations are under way for the purchase of the Indian Valley Railroad by the Western Pacific. If these are completed, it will probably mean a connection with the logging road at Westwood with the possibility of further extensions to the north.

Many places in the canyon of the North Fork of Feather River that are interesting from the standpoint of mining are now accessible only by riding on a train to one of the small stations in the canyon, and finishing the trip on a mountain trail. This condition will soon be corrected to a great extent by the new state highway now under construction, which will follow the canyon, but which, in part at least, will be on the opposite side from the railroad. This road is expected to afford a route over the Sierra Nevada that will be open at all seasons of the year with very little trouble from snow. Many points in the steep canyons and on the ridges will still be accessible only by pack train, but the new road will afford starting points for branch roads,

which can be built to open up large areas of possible value for mineral deposits.

Improved roads with surfaces of gravel and crushed rock reach many parts of the county at the present time. The road from Red Bluff to Susanville crosses the northern part of Plumas, passing through Chester and near Westwood. A branch extends south through Greenville and Crescent Mills to Quiney; and from Quiney roads radiate in all directions: westerly and southwesterly to Bucks and Oroville, easterly to

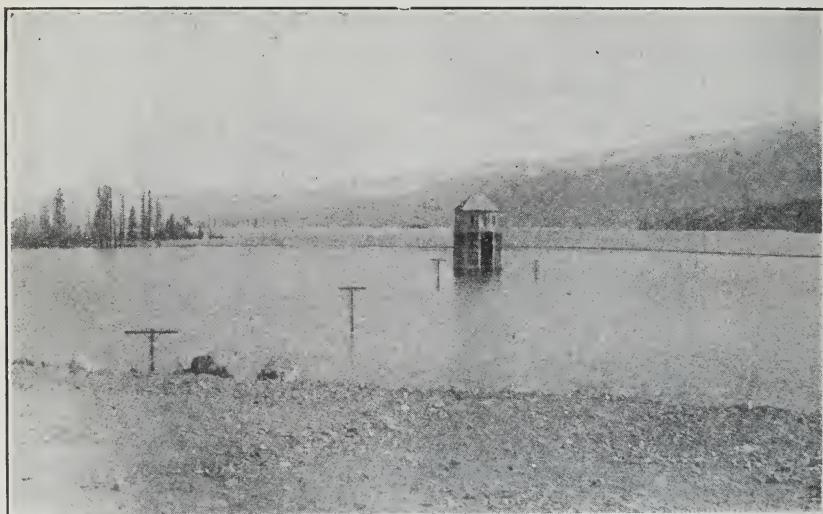


Caribou plant of the Great Western Power Company.

Spring Garden and Portola, southerly to La Porte, thence to Oroville. During the winter season, however, many of these roads are blocked by snow.

Power.

Many wonderful sites for the generation of hydro-electric power are afforded by the high relief and the abundant water supply of Plumas County. Several of these have already been developed and are in use, but many remain for future development. The Caribou plant of the Great Western Power Company, shown in the photograph, is typical of the plants now in operation. It receives water from Lake Almanor through a tunnel and penstocks under a head of 1100 feet, and has a generating capacity of 88,000 horsepower. The Las Plumas plant of the same company, lower on the North Fork and just across the line in Butte County, utilizes the outflow of the Caribou plant, together with such water as flows into the river between plants, and has a generating capacity of 87,000 horsepower. It is said that ten plants can be built on the North Fork, all to utilize the water of Lake Almanor, with a possible total output of 1,000,000 horsepower.



Lake Almanor, Plumas County.

A very interesting power plant was placed in operation early this year at Storrie on the North Fork. It is described in a recent issue of a small magazine published by the Western Pipe and Steel Company of California.¹ The principal units of this development are: (1) a main storage reservoir of a capacity of 116,000 acre-feet at Bucks Meadow, (2) a diversion reservoir on Bucks Creek, from which water flows through a tunnel into Grizzly Creek, (3) Three Lakes Reservoir with a steel conduit to the diversion reservoir, (4) Grizzly Creek Forebay and pressure tunnel leading to the penstocks, (5) twin penstocks down the mountain side, (6) the power house. Much ingenuity has been used to secure as high a percentage as possible of the runoff of the adjacent watershed. On account of the very high head of water used, special consideration was given to the design of the penstocks to

¹ Edgar A. Brown, Feather River Power Company Builds Highest Head Hydro-Electric Project in North America, *Western Pipe and Steel News*, San Francisco March, 1928.

eliminate the possibility of damage by water-hammer. To place the penstocks and deliver material to the upper operations, an inclined railroad 4800 feet long was constructed with an average angle from the horizontal of 30 degrees and a maximum of 48 degrees. This was operated by means of an electric hoist of 200 hp. with steel cable. The plant operates under a head of 2562 feet of water, and develops 70,000 horsepower.

Geology.

The general geology of the region can best be described by quoting extracts from publications of the United States Geological Survey. The following is from the Downieville¹ folio (now out of print), which contains, also, interesting descriptions of the gold-bearing gravels of the La Porte and nearby sections.

"The rocks of the Sierra Nevada are of many kinds and occur in very complex associations. They have been formed in part by deposition beneath the sea and in part by intrusion as igneous masses, as well as by eruption from volcanoes. All of them except the latest have been more or less metamorphosed."

"The northern part of the range, west of longitude 120° 30', consists prevailingly of clay-slates and of schists, the latter having been produced by the metamorphism of both ancient sediments and igneous rocks. The trend of the bands of altered sediments and of the schistose structure is generally from the northwest to the southeast parallel to the trend of the range, but great masses of granite and other igneous rocks have been intruded among these schists, forming irregular bodies which interrupt the regular structure and which are generally bordered each by a zone of greater metamorphism. These slates and schists and their associated igneous masses form the older of the great group of rocks recognized in the Sierra Nevada. This group is generally called the Bedrock series."

"Along the western base of the Sierra occur beds of sandstone and clay, some of which contain thin coal seams. These are much younger than the mass of the range and have not shared the metamorphism of the older rocks. They dip gently westward beneath the later deposits, which were spread in the waters of a shallow bay occupying the valley of California and portions of which have been buried beneath river alluvium."

"Streams flowing down the western slope of the Sierra in the past distributed another formation of great importance—the auriferous gravels. The valleys of these streams served also as channels for the descent of lavas which poured out from volcanoes near the summit. Occupying the valleys, the lavas buried the gold-bearing gravels and forced the streams to seek new channels. These have been worn down below the levels of the old valleys, and the lava beds, with the gravels which they protect, have been isolated on the summits of the ridges. Thus the auriferous gravels are preserved in association with lavas along lines which descend from northeast toward southwest across the trend of the range. The nearly horizontal strata along the western base, together with the auriferous gravels and later lavas, constitute the second group of rocks recognized in the Sierra Nevada. Compared with the first group, the Bedrock series, these may be called the Superadjacent series."

Lindgren² gives the following general description of the northern Sierra Nevada:

"The Paleozoic and early Mesozoic seas once extended over the site where the Sierra now lifts its broad back. Toward the close of the Mesozoic area the sediments were compressed in heavy folds, and the intrusion of granitic magmas forced them upward to lofty summits; after the intrusion the fissures and joints of granitic rocks and altered sediments became filled with veins and seams of gold-bearing quartz. A long period of erosion in the early Cretaceous planed down the new-born mountains. The concentration of the gold from the veins began in countless streams. Pauses in the erosion, when the topography had been reduced to gentle outlines, permitted deep rock decay and promoted the liberation of gold from its matrix. Renewed uplift quickened erosion and facilitated the further concentration of gold. Throughout Cretaceous and Tertiary time these conditions continued. Fluctuations of the western shore line at times extended the streams far into areas now occupied by the Sacramento and San Joaquin valleys, or caused these water courses to debouch upon flood plains reaching high up on the flanks of the range. Faulting movements, with downthrow on the east side, probably being in Cretaceous time, had transformed an approximately symmetrical range to a monoclinal one with steep easterly slope. Gradually the mountains were thus reduced to gentler slopes and the canyons widened to valleys. Meandering among longitudinal ridges, the rivers flowed from low divides to rolling foothills and the whole slope was clothed in the dense vegetation of a damp semitropical climate."

¹ Turner, H. W., U. S. Geol. Survey. Geol. Atlas of the U. S., No. 39, Downieville.

² Lindgren, Waldemar. The Tertiary Gravels of the Sierra Nevada of California, U. S. Geol. Survey, Professional Paper 73. (Out of print.)

"Long quiescent volcanic forces asserted themselves toward the end of Tertiary time, contemporaneously with the greatest volcanic activity in the Great Basin. Rhyolite flows filled the valleys, covered the auriferous gravels, and outlined new stream courses in the old valleys. Renewed disturbance began along the scarcely healed eastern breaks, resulting in a westward tilting of the main blocks, probably combined with normal faulting. In consequence of this disturbance the monoclinal nature of the range became strongly emphasized and the streams immediately began to cut their beds deeper; they repeatedly crossed their old courses and the concentration of gold in the new canyons proceeded under less favorable torrential conditions. Eruptions of andesitic tuffs began in enormous volume and effectually buried a large number of the streams, filling their valleys to the rims. At the close of the Tertiary period a steaming, desolate expanse of volcanic mud covered almost the whole of the northern Sierra, in startling contrast to the peaceable verdure-clad hills of the Miocene. In a thousand rills the storm waters flowed down the slope, excavating rapidly in the soft tuffs. The rills became gullies, ravines, creeks, and new master streams. Torrential grades magnified the erosive power, and thus began the canyon-cutting epoch of the late Pliocene and early Quaternary, amazing in its results, as we see them today. The new streams excavated sharp, V-shaped trenches in the hard rock to a depth of 1000 to 4000 feet below the surface of the flows. In many places the old rivers of the Tertiary period were exposed and cross sections of their valleys are now seen on the steep canyon slopes high above the present river beds. Large stretches of the old channels remained secure below their blanket of 1000 feet of hardened volcanic mud. Wherever the canyon-cutting streams destroyed the old channels the gold in those channels became concentrated in the canyons and thousands of quartz veins added to the previous concentrates; but owing to the steep grades of the Quaternary rivers much of the detrital material and the fine gold was swept out into the valley at the western foot of the range over alternately advancing and retreating flood plains.

"The barren lava flows and the canyon slopes again became clothed by vegetation, this time of a type belonging to a cooler but still temperate climate. Later in the Quaternary the scenes changed again. The summits became covered with persistent snows, which eventually consolidated to névé and to ice. Glaciers filled the upper valleys, but only for a comparatively brief time, disappearing rapidly before the drying winds of a warmer climate and leaving the summit region a desolate expanse of dazzling white, bare granite or reddish schists.

"During the last brief span of a few thousand years the Sierra Nevada has remained as we now see it, with the pleasing oak groves of the foothills, the somber giant pines of the middle slopes, and the storm-scarred hemlocks of the summit ridges."

Diller¹ has described the geology of the Taylorsville region, including the mountains surrounding Indian and Genesee valleys; and Haley² has described many of the deposits of auriferous gravel. Other notes on geology will be found in the descriptions of individual mines, particularly that of the Engels mine, where recent geological work has been done.

Mineral Deposits.

Gold was the attraction that first drew explorers into Plumas County, and it was found and mined in large qualities, first on a small scale by means of the pan and rocker of the individual prospector and miner, later on a large scale by mining companies employing the hydraulic method. The hydraulic mines washed a tremendous quantity of gravel from the mountains into the streams during the years from 1870 to 1883. The resulting debris became so troublesome to the farming interests that court decisions were made and laws were passed which prohibited the washing of tailings into the streams. In March, 1893, the Caminetti Act was passed by congress to enable hydraulic mines to operate behind dams for restraining the tailings or debris. The restrictions, however, are so severe, and the length of time that a license to operate will remain in force is so uncertain, that very little mining has been done under the Caminetti Act. This matter has been the subject of a recent investigation, a report on which may be found in the January, 1927, issue of *MINING IN CALIFORNIA* published by the State Division of Mines and Mining. If this problem of debris control can be worked

¹ Diller, J. S., Geology of the Taylorsville Region, California, U. S. Geol. Survey Bull. 353.

² Haley, C. S., Gold Placers of California, California State Mining Bureau, Bull. 92, 1923.

PLUMAS COUNTY, 1880-1927.

Year	Copper		Gold, value	Silver, value	Manganese		Miscel- lanous stone ¹ , value	Miscellaneous and unapportioned		
	Pounds	Value			Tons	Value		Amount	Value	Substance
1880			\$857,124	\$181						
1881			1,350,000	2,000						
1882			1,250,000							
1883			950,000							
1884			900,000							
1885			840,308							
1886			834,452	62						
1887			698,069	16						
1888			650,000	250						
1889			796,754	235						
1890			490,664	811						
1891			482,462							
1892			432,295	11,731						
1893			362,488	14						
1894			499,359							
1895			602,951	271						
1896			462,527	83						
1897			330,232	701						
1898			369,609							
1899			381,151	15						
1900			365,210	4,159						
1901			401,287	2,508	1	\$10				
1902			380,686	517	2	40				
1903	1,900	\$247	424,112	510						
1904			270,439	464	1	25				
1905	1,006	157	283,810	530						
1906			229,350	1,055	1	30			\$25	Platinum.
1907			210,355	948	1	25				
1908			254,737	3,560	1	25				
1909			157,191	587	3	75				
1910			187,207	1,038	5	75				
1911			228,785	1,125	2	40				
1912	6,963	1,149	193,237	957	2	40				
1913	*19,533	3,028	138,368	705						
1914	*169,089	22,489	140,000	2,900						
1915	3,164,496	553,787	167,440	19,025						
1916	4,932,928	1,213,500	133,385	46,542						
1917	7,462,870	2,037,361	131,955	74,461	1,540	39,680	1,322	473 tons	9,800	Chromite.
1918	11,098,016	2,741,210	125,207	156,750	1,544	61,754	7,750		304	Gems, granite, silica.
1919	10,193,951	1,896,075	83,600	175,846					23	Other minerals.
1920	9,583,834	1,763,425	102,097	153,373					1,825	Limestone, manganese.
1921	11,584,216	1,404,364	127,148	171,090					2,658	Granite, lead, lime, platinum.
1922		20,677,771	2,701,499	223,025					133	Lead.
1923		22,883,600	3,363,891	174,871					1,615	Platinum.
1924		25,557,362	3,348,015	277,571					4,111	Granite and miscellaneous stone.
1925		26,950,029	3,820,904	219,540					2,720	Granite, platinum, miscellaneous stone.
1926		22,163,035	3,102,825	247,667					750	Other minerals.
1927		21,055,425	3,758,261	321,016					2,950	Chromite, granite.
Totals		197,506,033	\$31,918,190	\$19,788,061	\$2,313,795	#2,103	\$101,819	\$104,659	30,810	Chromite, granite, manganese ore, miscellaneous stone.
									5,516	Granite, lead, manganese ore, platinum.
									2,338	Granite, lead, lime.

¹Includes crushed rock, rubble, rip-rap, sand, gravel.

²See under "Unapportioned."

³Includes copper erroneously credited to Lassen County in those years, on account of shipping point being Doyle, though the mines were located in Plumas County.

out, hydraulic mining can be resumed in the northern Sierra Nevada on many gravel deposits known to contain gold.

When forced to cease mining by the hydraulic method, some of the operators proceeded to mine the richer portions of the deposits by the underground or drift method. The richness of deposits must be many times as great, however, to return a profit by underground mining because of the higher cost. Drift mining is used also to reach the many ancient channels that remain buried under hundreds of feet of lava.

Quartz veins containing gold have been mined in various parts of Plumas County, particularly in the Seneca, Greenville, Crescent Mills, Johnsville and Spring Garden districts. Without exception, amalgamation is being used to recover the metal in the few small mills now in operation on gold ores. Practically all of these ores contain copper or iron sulphides either near the surface or at depths of a few hundred feet; and the process of amalgamation does not yield complete extraction. However, many of these veins have yielded a profit in the past; and while the costs of labor and some supplies are now high, those of transportation and power have been greatly lowered. Better metallurgical processes now available for treating base ores, the flotation process for instance, should also help to bring these mines again into profitable operation. Elementary though it seems it can not be too strongly urged that, before the installation of any mill is considered, the operator should thoroughly satisfy himself regarding the actual metal content of the ore, the quantity of ore available, and the successful operation of the metallurgical process by exhaustive preliminary tests. These tests cost little compared to the cost of even a small treatment plant, but if they are neglected, the result will probably be that all of the money invested in the mill will be lost. The builders of at least three mills that have recently been completed or are now being constructed in the northern part of the state have neglected these precautions. Although one of these has been completed only a few months, the machinery is already for sale.

The important mining in Plumas County at present is copper mining. A well-defined copper belt extends through the north-central portion, starting near the county line, and extending southeasterly through Engelmine, Genesee and Walker Mine. Two large mines, the Engels and the Walker, are each treating 1000 tons of ore per day; and many prospects have been discovered along this belt, which follows the western contact between the Carboniferous¹ and a great intruded mass of plutonic rocks. Several of these prospects are active at the present time and the ultimate development of other copper mines along this belt is a probability.

A report² of the State Mining Bureau on the mines and minerals of Plumas County, dated December, 1918, describes mines and prospects of chromite, manganese and molybdenum. These are now inactive and will receive no further description here. The report just mentioned also gives descriptions of the topography and geology of individual mining districts, and the history of the gold and copper mines up to that date. Copies are still available at the offices of the Division of Mines and Mining, so only such portions will be repeated here as have a direct bearing on recent or present operations.

¹ Geological Map of the State of California, State Mining Bureau, 1916.

² MacBoyle, Errol, Mines and Mineral Resources of Plumas County, Chapter of State Mineralogist's Report, Biennial Period, 1917-1918.

Acknowledgment.

The writer wishes to acknowledge the assistance of mine owners and operators throughout the county, including W. I. Nelson of Engelmine, H. A. Geisendorfer and C. D. Arrieta of Walker Mine, W. J. McMillan of Seneca, C. E. Wardlow, Harry Wardlow and F. J. Standart of Greenville, L. L. Clough and H. C. Flournoy of Quincy.

COPPER

Barnes Prospect. Owner, Harry Barnes, Engelmine. Eighteen claims adjoining the property of the Engels Copper Mining Company to the north form this group. A 36-ft. shaft and a 100-ft. tunnel are said to have exposed ore containing chalcocite. The Greenwood group adjoins.

Beardsley (Telge). Owner, L. B. Longnecker, trustee, c/o A. L. Beardsley, 827 Roosevelt Building, Los Angeles. Location, Secs. 14 and 15, T. 26 N., R. 11 E. A steep wagon road seven miles long runs from Beardsley siding on the Indian Valley Railroad near Taylorsville to the mine. Genesee can be reached from the mine by a trip of seven miles on a mountain trail. Claims called Magma Nos. 1 to 16, 320 acres, are held by location.

A disseminated deposit containing commercial quantities of copper, gold and silver is said to have been found at this property. It has been developed to a depth of 300 feet by means of a shaft and several hundred feet of tunnels. The mine has been idle for some time past and was not visited by the writer. Reorganization of the company is planned.

Equipment consists of compressor, hoist and machine drills. A mill equipped with a 12 x 20-inch jaw crusher, 5 x 8-ft. ball mill and flotation cells is on the property. All machinery was driven by electric power purchased from the Great Western Power Company.

Big Cliff. Owner, Genesee Con. Mines Co., A. L. Beardsley, president, 827 Roosevelt Building, Los Angeles; G. M. Beardsley, secretary. The home office is at 250 Lake St., Reno, Nevada. Location, Secs. 24, 25 and 35, T. 26 N., R. 11 E. 160 acres are held by claims called Big Cliff Nos. 1 to 8. MacBoyle¹ says that great masses of the cliff have been blown off and some of the rock shows small amounts of bornite. No work to develop the deposit has been done since 1920.

Bull of the Woods. Nothing is known of the present ownership of this property by the writer. It is said to have been developed by means of two shafts 50 feet deep, a crosscut from one of which exposed 28 ft. of ore containing 2% copper and 8 oz. silver and \$7 in gold per ton. The location is at the head of Lights Creek, five miles north of Engelmine.

Cooper Mine. Owners, Goodhue Bros., Genesee. Location, Sec. 14, T. 25 N., R. 11 E. in the mountains overlooking Genesee Valley. A good dirt road runs from Veramont Station on the Indian Valley Railroad to Genesee, but the last two or three miles from Genesee to the mine is very steep unimproved mountain road. 120 acres are held by

¹ MacBoyle, Errol, Mines and Mineral Resources of Plumas County, Chapter of State Mineralogist's Report, Biennial Period 1917-1918.

claims called Victory Nos. 1 to 6. A 400-ft. and a 500-ft. tunnel and a 200-ft. shaft are said to have been driven on this property, but these are now caved.

L. V. Goodhue and W. M. Downard have a lease on this deposit, and are hauling ore from the dump of one of the old tunnels to the Gruss mill. This mill is equipped with 10 stamps, a crusher, compressor and two Calow flotation cells. There is also a small ball-mill, but this is not being used. A small amount of ore is being saved from some open cuts above the tunnel dump, but the road does not reach these, so at present this ore is not available. The cuts are in andesite in which are many quartz stringers carrying tetrahedrite. The material exposed is so badly broken that the attitude of the vein can not be determined. Goodhue and Downard claim to have traced this vein for a distance of 500 feet.

Cosmopolitan. See Reward.

Cottonwood Group. Owners, Tom Carr, Harry Ryan, Garrett Barry, Mrs. Lindquist, Mrs. Brashear and Joe McAllister, all of Susanville. Location, eight miles southeast of Westwood. 17 claims are held by location. Development consists of a 258-ft. tunnel in diorite. Native copper is said to be found on the surface in many places.

Engels Copper Mining Company. Owners, same company, 393 Mills Building, San Francisco, California. F. Klamp, president; L. A. Bell, secretary. E. E. Paxton is general manager and the staff at the mines includes W. I. Nelson, superintendent, and A. G. Cole, chief engineer. Eighty-two per cent of the stock is owned by the California Copper Corporation.

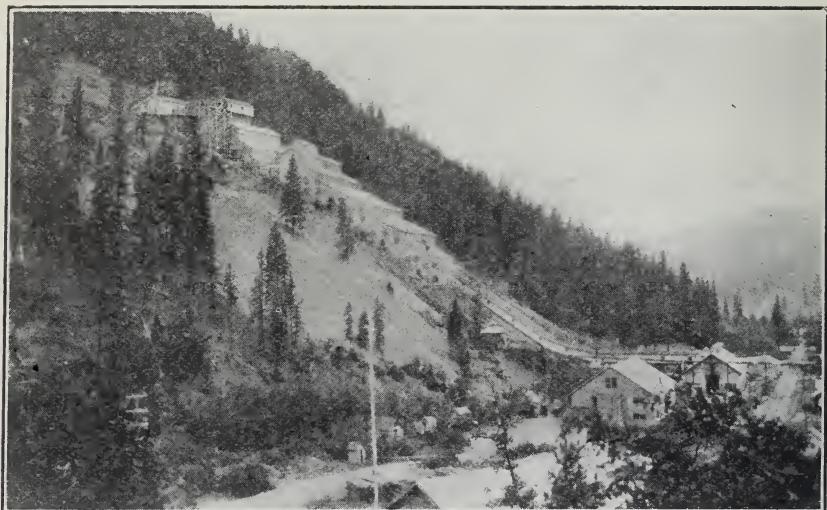
Location: Secs. 32, 33, 34, T. 28 N., R. 11 E. and Secs. 3, 4, 5, 8, 9, 10, 15, 16, 17, 19, 20, T. 27 N., R. 11 E. The town of Engelmire, consisting of the boarding house, store, bunk houses, hospital and cottages for employees, all owned by the company, is located in Lights Canyon, and is at the terminal of the Indian Valley Railroad, which runs 20 miles, partly through Indian Valley, to Paxton, a station on the Western Pacific. The property is opened by means of two mines, the Superior located on the side of Lights Canyon above the mill and practically in the town of Engelmire, and the Engels mine located about a mile northeast of the town. Greenville and Taylorsville can be reached from the mine by means of good automobile roads, and Susanville by a road that was in bad condition at the time of the visit, but which is since said to have been repaired.

Property: Comprises 181 quartz claims, area 3740 acres. In addition to this an area of 900 acres is owned for tailings reservoirs, timber supply, and rights of way, making the total area 4640 acres. Part of the property held for the disposal of tailings was formerly known as the Stark ranch. Patented claims are held as shown in mineral surveys 4753, 5256 and 5780.

Geology and Orebodies: A comprehensive study of the geology of the Engels and Superior mines has recently been made by Professor Charles A. Anderson of the University of California. This has been freely used in the description of the geology which follows, but has been supplemented with observations by the writer at the mines in company with W. I. Nelson, superintendent, with whom the geology was discussed.

The Engelmire area is a part of what Diller¹ has called the Diamond Mountain Block, which has a width of 20 miles and a length of over 50 miles. The block has a northwest-southeast trend, and is bounded by a prominent escarpment on the east side that separates the block from Honey Lake Valley. The slope to the southwest of the escarpment is long and gentle, and Diller referred to it as the plateau slope, which grades into a series of valleys that lie in a northwest-southeast belt. The average elevation of the plateau slope is about 6000 feet, rising to 7000 feet at a number of points. Diller points out that the upper courses of the streams are in broad, shallow valleys, but as they approach the middle portion of the block, they flow in deep canyons.

Lights Canyon, in the Engelmire area, is an example of one of the deep canyons. Lights Creek has an elevation from 3400 to 4200 ft., while the surrounding ridges have an elevation of 6000 feet. The



Mill of Engels Copper Mining Company. Rated capacity 1500 tons per day.

Engels Mine is located on a ridge of gentle slope, and erosion has not recently been nearly as active as at the Superior Mine, which is located on the steep slope of Lights Canyon.

The principal rocks exposed in the Engelmire area are plutonic, varying from gabbro-diorites to true granites with associated dike rocks. The older plutonic rocks, gabbro, diorite and quartz diorite, are part of a large batholith of which the western border appears in the Engelmire area. The other plutonic rocks occur as two stocks, one consisting predominantly of quartz monzonite, while the other is a true granite. There appears to be a relationship between the age and the acidity of the plutonic rocks, the older being more basic and the younger progressively more acid. No evidence was found that there was a large time interval between intrusions. They are probably the result of one major plutonic sequence, presumably occurring during late Jurassic time. Two types of pre-plutonic rocks occur in the area.

¹ Diller, J. S., Geology of the Taylorsville Region: U. S. Geol. Surv. Bull. 353.

The older type is predominantly rhyolitic forming a series of tuffs and possibly associated flows. The younger type is an intrusive andesite porphyry. The age of the rhyolite series and the andesite was not determined by Anderson, but is suggested as possibly Carboniferous.

A very interesting contrast exists between the ore of the Engels Mine and that of the Superior Mine, especially when it is considered that the two deposits are only about a mile apart. The ore of the Engels is disseminated through the rock, while that at the Superior is in well-defined fissure veins. The geology of these will be considered separately.

Engels Mine

The orebody of the Engels Mine occurs primarily in the diorite, but quartz diorite, microcline aplite and pegmatite dikes also appear in the underground workings. The chief metallic minerals in the mineralized diorite are magnetite, ilmenite, chalcopyrite and bornite. The characteristic features of the mineralization is the streaked appearance of the ore due to the arrangement of small sub-parallel bands of chalcopyrite and bornite. These bands follow the direction of the orebody, which has a general attitude of N. 60° E. with a very steep dip to the north.

Turner¹ mentioned that the diorite varied from medium to fine grain, with the ore occurring in the finer-grained facies. This is of fundamental importance, for the finer-grained facies appear to be the sheared and recrystallized diorite. In many places the finer-grained diorite is distinctly schistose, the abundant biotite determining the structure. In the biotite-poor varieties, the rock is more massive, but has a darker color than the normal diorite. Shear zones appear to be due to rock flowage or flow-cleavage. The presence of sheared andesite porphyry directly west of the Engels Mine glory hole substantiates the suggestion that the shearing occurred shortly after the consolidation of the diorite, for none of the other plutonic rocks exhibit shear zones in the near vicinity. The shearing in the diorite was evidently followed immediately by renewed activity on the part of the magma because biotite, hornblende, orthoclase and quartz are present in large crystals entirely surrounding the granulated minerals. Orthoclase and quartz are lacking in the normal diorite and their presence only in the sheared zones indicates their formation after shearing. The chief interest attached to the shear zones is the presence of the metallic minerals, bornite and chalcopyrite. These minerals occur almost entirely in the sheared zones in streaks or bands parallel to the direction of the shearing. In the main orebody, the bands may be narrow and scattered throughout the width of the shear zone; but frequently there is a concentration of the ore into one or two bands, one to three feet in width, with a number of small disseminated bands in the remainder of the zone. The large bands are usually called the

¹ Turner, H. W., and Rogers, A. F., A Geologic and Microscopic Study of a Magmatic Copper Sulphide Deposit in Plumas County, Economic Geology, Vol. IX, No. 4, 1914.

See also:

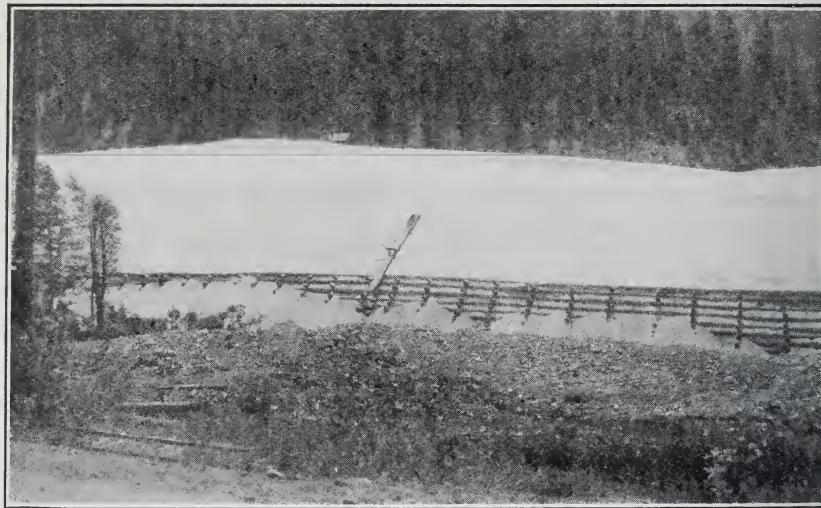
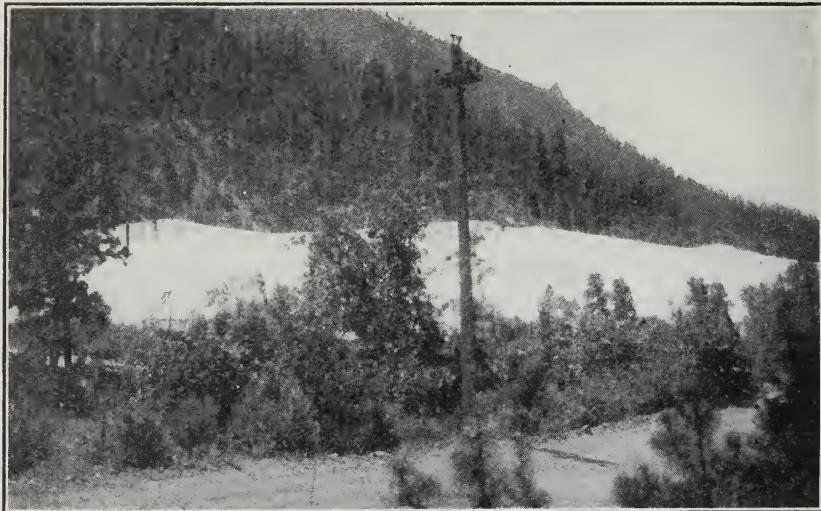
MacBoyle, op. cit.

Graton, L. C., and McLaughlin, D. H., Ore Deposition and Enrichment at Engels, California, Economic Geology, Vol. XII, No. 1, January, 1917.

Read, Thomas T., The Engels Mine and Mill, Min. and Sci. Press, Vol. 111, p. 167, 1915.

'hanging-wall streak' and the 'foot-wall streak,' depending on their location in the shear zone.

The formation of the ore probably proceeded as follows: First came the intrusion of a diorite magma that solidified without an appreciable content of copper sulphides. Stresses in the diorite followed and these



Two views of tailings pile, Engels Copper Mining Company.

developed zones of shearing or flow-cleavage. Under high-temperature conditions, these zones afforded paths along which copper sulphides and iron oxides and some silicates found their way, probably aided by mineralizers; and the granulated minerals of the shear zones were surrounded and replaced. Intrusion of quartz diorite and aplite dikes

followed, but these appear to have had nothing to do with the mineralization.

The orebody in the Engels Mine has been worked to a vertical depth of over 1300 ft., and in its longest part, on the 7th level, has a length of 800 feet. This same part has a maximum width of 100 ft., but the average width of the entire orebody is 40 to 50 feet. The main orebody splits just above the 8th level, and from there down the northerly portion is called the North orebody. At a distance of 300 to 400 ft. southerly from the main orebody on the 6th, 7th, 8th and 10th levels is an orebody known as the 02 orebody, with an average length of 150 feet. A winze has recently been sunk from the 10th level to a little below the 12th level in the diorite between the main orebody and the 02. Ore was found in this winze below the 12th level and also in workings driven from it on the 12th level. Evidence of a shear zone indicating the possibility of a new orebody was also found. The ore found in the shaft is said to have been of a better grade than that found on the 12th level. To date, insufficient development work has been done to indicate the extent of this ore, but development is being pushed ahead in this section of the mine at the present time.

Superior Mine.

The Superior Mine is located on the east side of Lights Canyon, practically in the town of Engelmine, but a little to the south. The portal of No. 2 adit is north of the mill at an elevation slightly above Lights Creek, while the main shaft and the portal of No. 1 adit are at the eastern end of the mill at an elevation of about 200 ft. above Lights Creek. The mine occurs in the quartz monzonite, formerly known as Superior grano-diorite, near its southern contact with the pre-plutonic rocks. Soda-granite porphyry and lamprophyre dikes intruding the quartz monzonite are also found.

Development has shown that there is a series of veins, very roughly parallel, with a north-south strike and a variable dip to the east, averaging 40°. Only one of the veins, the A vein, outerops at the surface. The K vein is of interest because it flattens before reaching the surface, and continues for some distance as a nearly horizontal vein. The veins average 8 to 12 feet in thickness, and are sharply set off from the quartz monzonite. Typically, they are composed of a dark greenish-black gangue mineralized with chalcopyrite and small amounts of bornite, magnetite and pyrite. The gangue consists of black tourmaline, green mica, actinolite, quartz, epidote, chlorite, apatite, titanite and siderite.

The mineralization is the result of several stages. First, the quartz monzonite was fractured and the fractures were filled with green mica, tourmaline, actinolite, quartz, apatite and magnetite, with some replacement of the quartz monzonite. Later movements opened new fractures in the minerals just named and in the quartz monzonite; and the introduction of siderite, chlorite, epidote, sericite, chalcopyrite and a small amount of pyrite and bornite followed. Another period of fracturing was followed by the introduction of dolomite and possibly a little quartz. Fracturing of the dolomite was followed by the introduction of more quartz and pyrite, chalcopyrite, tetrahedrite, galena and sphalerite. The galena and the tetrahedrite contain silver. The ore minerals of these veins were deposited under hydrothermal conditions. The earlier minerals accompanying the tourmaline may have

been formed under pneumatolitic conditions, with a gradual gradation to the hydrothermal action which deposited the sulphides.

Development: The Engels Mine is opened by means of 10 levels, served by the No. 10 adit, and two levels reached by a winze from the latter, the 11th and 12th. The No. 10 adit is 490 ft. vertically below the 7th level and 1219 ft. below the surface. It is 8½ ft. high, 8 ft. wide and is equipped with 30 lb. rail and 8½-inch casing for compressed air. The cost of driving 8357 ft. of this, including the necessary equipment for driving, was \$28.75 per foot. Other costs connected with the opening of this tunnel are given in the annual report of the company for 1923, as follows:

8357 ft. of tunnel-----	\$240,246 01
Two 490 ft. raises-----	25,305 39
6505 ft. of 24 in. gauge railroad to mill-----	39,039 32
Additions to mill-----	15,853 35
Water line, tunnel to mill-----	10,358 61

Estimate to complete-----	\$330,802 68
	75,000 00

	\$405,802 68

The following development work was done in 1927:

Drifts -----	8,161 ft.
Raises -----	4,667 ft.
Shafts -----	78 ft.
Diamond drilling -----	19,980 ft.

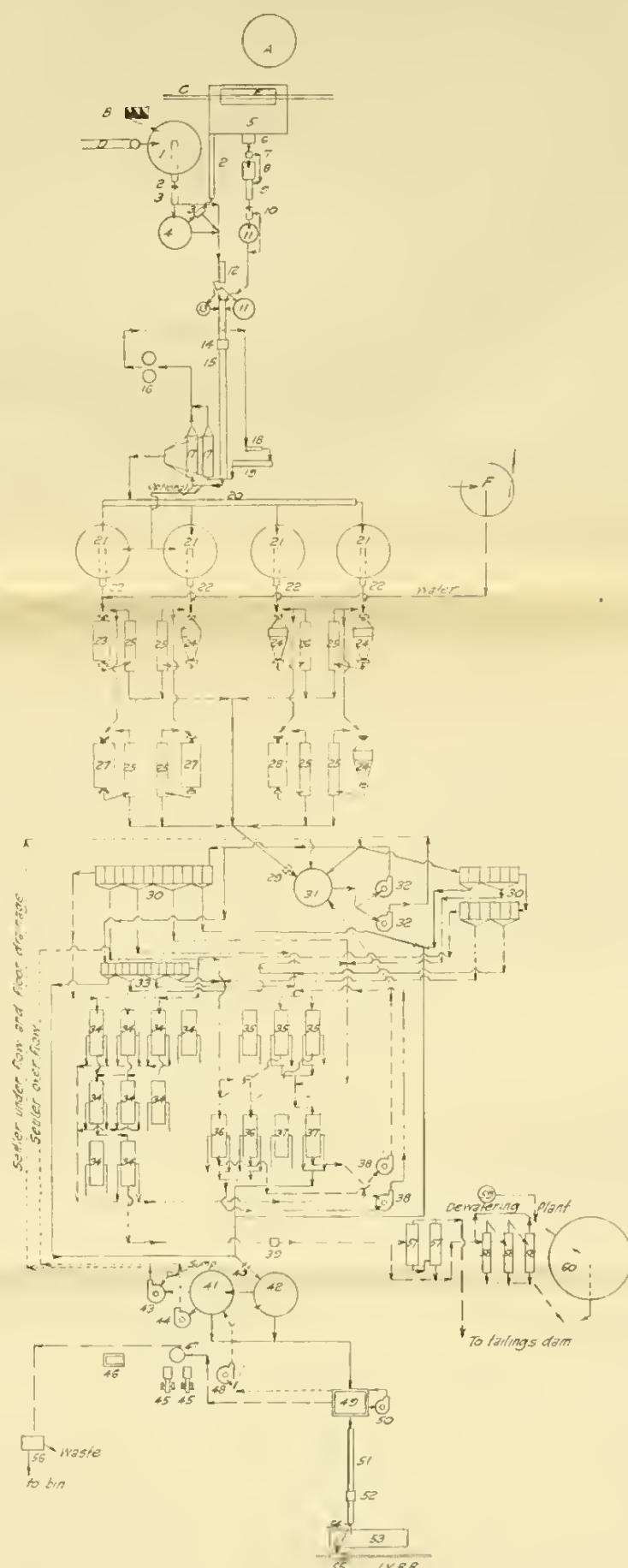
Stopes in the Engels Mine are 600 ft. long, 40 ft. wide, and extend for a height of 1300 feet. Ore reserves are estimated at 777,034 tons of ore containing 2% copper.

The Superior Mine is opened by the following levels: A, 1, 2, 3 and 4. The No. 2 adit is at about the level of Lights Creek and the portal is near the main office and machine shop. The main shaft and the portal of the No. 1 adit are 200 ft. above at the east end of the mill. The A level is 300 ft. above the No. 1. Stopes in this mine are 200 to 300 ft. long by 10 ft. wide and 400 ft. high. Only a minor quantity of ore was being produced from the Superior at the time of visit.

Electrical prospecting has recently been used to explore an area of 1372 acres; and a number of possible ore-bearing areas were indicated. Three of these areas near the Engels Mine were then prospected by diamond drilling, but without favorable results. The remaining areas are to be prospected by surface trenching. Trenching of some of the indicated areas near the Superior Mine has uncovered sufficient signs of ore to warrant further prospecting with the diamond drill. Underground drilling from the A level in the Superior Mine indicated ore extending downward, and development work to open up this ore is now under way.

Equipment: Ore is hauled from the Engels Mine to the mill in trains of ten 6-ton cars by trolley-locomotives. Three locomotives of 3-ton, 4-ton and 6-ton size are in use on this system. Four storage-battery locomotives in sizes from two to four tons are used for haulage in other parts of the mine. The main shaft at the Superior Mine is equipped with an electric hoist of 250-hp. and a 110-ft. steel head-frame

	Description
A.1	Water tank for fire or mill supply
B.1	Superior Mine shaft
C.1	Superior railroad from Engels Mine
D.1	Rope tram from Engels Mine
E.1	Car entrance
F.1	Mt water supply tank
G.1	Steel ore bin
H.1	Pan conveyor 30'
I.1	Grizzly 3'
J.1	No. 8 Taylor gyratory crusher
K.1	Conical ore bin
L.1	Empty feeder
M.1	Grizzly 3'
N.1	Low Caster 36" x 64" A.M.S. Chambers
O.1	66" conveyor
P.1	No. 6 A.M.S. Chambers gyratory crushers
Q.1	Grizzly 16"
R.1	No. 5 Taylor gyratory crusher
S.1	Conical weightometer Hennicot
T.1	Steel conveyor 64'
U.1	Superior bins 54" x 28"
V.1	Sergeant hummer
W.1	Steel conveyor 20'
X.1	Steel conveyor 18'
Y.1	Steel conveyor 6'
Z.1	Steel ore bins
A.2	Feeders - 2 ft. - 2 ft. 9 in.
B.2	Marcy M. No. 86
C.2	Marley mills 8 x 36'
D.2	20 ft. classifiers 6 x 21' type D
E.2	20 ft. classifier type C
F.2	20 ft. 3 ft. 6 x 12' P & M
G.2	20 ft. mill 7 x 10 ft. 6 ft. 6 ft. P & M
H.2	Automatic head sampler
I.2	Minerals separation machines - 1000 ft. 24"
J.2	Doyle thickener 2000 ft. 1000 ft. 2000 ft.
K.2	Centrifugal pumps - sand
L.2	Mycroft separation machines - 1200 ft. 18"
M.2	Screen coils 6 ft. 6 ft. USE 6 ft. 4 ft. 10 ft. 10 ft.
N.2	Concentrator filter 2 ft. 12 ft. 12 ft.
O.2	Concentrator - secondary
P.2	Concentrator - 110 ft. 100 ft.
Q.2	Centrifugal sand pump
R.2	Automatic tail sampler
S.2	Automatic concentrator sampler
T.2	Concentrator tank
U.2	20 ft. breaker
V.2	3' centrifugal pump
W.2	3' centrifugal pump 2 stages
X.2	Vacuum pumps Oliver 4" x 18"
Y.2	Surgeon's blower No. 6
Z.2	Vacuum tank
A.3	Centrifugal slurry pump 3"
B.3	2 ft. filter
C.3	Centrifugal circulating pump 3"
D.3	Steel conveyor
E.3	Conveyor weightometer - Hennicot
F.3	Emergency concentrate bin
G.3	Steel conveyor over cars
H.3	Gondola cars - 10 smelter
I.3	Sup.
J.3	20 ft. classifiers
K.3	Disc classifiers
L.3	Wire mining tank
M.3	Doyle thickener 80 x 16'



FLOW SHEET SUPERIOR MILL ENGELMINE COPPER MINING CO.

ENGELMINE CALIF.
MAY 1924

Other hoists in use are 150-hp. on the No. 3 shaft from the 10th level, 75-hp. on a raise from the 10th level, 50-hp. sinking hoist at No. 3 shaft, and 50-hp. on the No. 2 shaft at the Superior. Compressors include the following sizes: two 2300, one each 900, 800, 400 and 300, figures representing capacity in cubic feet of free air per minute. A 400-hp. generator with Pelton wheel produces power for about eight months of the year. Water comes from Lights Creek under a head of 500 ft. through 3½ miles of ditch and flume. Drill sharpeners include two Type I.R. 50 and one Type I.R. No. 4 with oil-fired furnaces. The greater part of the power required to drive the machinery mentioned is furnished by the Great Western Power Company at a cost of less than one cent per kwh. Heating is done with two steam plants burning oil.

Mill: The appearance and general arrangement of the mill are indicated by the photograph and the flow-sheet. The cost of this mill complete is given in the annual report for 1924, as \$536,436. Fuel oil, crude pine oil, potassium xanthate, and tri-sodium phosphate are used as frothing agents. Other details of the operation of the mill for 1927 follow:

Average assay of heads (% Cu)-----	1.788
Average assay of tails (% Cu)-----	0.193
Average assay concentrate (% Cu)-----	27.470
Indicated recovery (% Cu)-----	89.84
Actual recovery (% Cu)-----	88.14
Pounds copper in concentrate produced-----	12,121,756.00
Difference between Cu in heads and tails (lbs.)-----	12,355,245.37
Per cent insoluble in concentrate-----	32.96
Per cent material on 100 mesh-----	12.19
Average barrels of lime used per day-----	3.8646
Average barrels of lime used per 100 tons ore-----	.364
Tons ore settled per barrel of lime-----	259.190
Ratio of concentration—17.435 to 1.	

	<i>Total for year, 1927</i>	<i>Average per ton of ore milled, pounds</i>
Pounds of 5-inch balls used-----	490,440	1,2759
Pounds of 2½-inch balls used-----	326,480	8487
	-----	-----
Total pounds of balls used-----	816,920	2,1246
Pounds of liners used-----	155,324	.4038
Pounds of flotation reagents used-----	227,628	5917
Barrels of lime used-----	1,399	.00363
Tons of ore crushed-----	384,462	-----
Tons of ore crushed, average per day-----	1,062.05*	-----
Tons of ore milled-----	384,671	-----
Tons of ore milled, average per day-----	1,062.63	-----
Tons of concentrate produced (dry)-----	22,063.516	-----
Tons of concentrate produced, average per day-----	60.950	-----

* Computed on an operating year of 362 days.

Costs:

The following figures are from the annual report for 1927:

Production

12,121,756 lbs. copper @ 12.9148¢-----	\$1,565,502 52
125,177 oz. silver @ 56.5579¢ (less 5%)-----	67,257 32
1.712 oz. gold @ \$19-----	32,526 69

	\$1,665,286 53

		<i>Cost per lb. of copper, cents</i>
Operating cost-----	\$919,354 10	7.5843
Freight and smelting-----	\$571,487 53	
Credit silver and gold-----	99,784 01	
	471,703 52	3,8914
Operating and market cost-----	\$1,391,057 62	11.4757
Reserve for depreciation-----	77,968 71	.6432
Add development and exploration amortization-----	273,249 94	2.2542
Total cost Cu production-----	\$1,742,276 27	14.3731
 <i>Cost per ton of ore</i>		
Tons of ore—384,671.		
Mining cost-----	\$498,091 68	\$1.2949
Milling cost-----	259,974 23	.6758
Taxes, interest, insurance-----	89,238 99	.2320
Electric haulage-----	25,027 99	.0651
Loading concentrate-----	2,991 58	.0078
General expense, administration and superintendence-----	44,029 63	.1144
Total operating cost-----	\$919,354 10	\$2.3900
Depreciation -----	77,968 71	.2027
Development and exploration-----	273,249 94	.7103
Total cost exclusive of freight and smelting-----	\$1,270,572 75	\$3.3030

Attention is called to the large expenditure for development and exploration. Concentrates are shipped to the plant of the American Smelting and Refining Company at Garfield, Utah. Figures for the freight and smelting are given in the preceding table. They raise the total cost per ton of ore to about \$4.50. A total of 336 men are employed.

The annual report for 1926 gives the following figure for dividends paid from the beginning of operations in 1914 to the end of 1926: \$1,285,971.55.

Greenwood Group. Owner, Tom Carr, Susanville. This group consists of 14 claims adjoining the property of the Engels Copper Company to the north. Development consists of 20 to 25 surface cuts which have exposed indications of copper ore.

Hinchman. Owners, Genesee Con. Mines Co. See notes on 'Big Cliff' for officers and address of this company. Location, Sec. 6, T. 25 N., R. 11 E. MacBoyle¹ describes this as a fissure vein near the contact of sandstone and meta-andesite, containing bornite ore. The average width of the vein is 2 ft., the strike N. 20° W., and the dip 70° SW. At that time the tunnel was in 400 ft. It is now in 500 ft.; and the claims held are the Hinchman Nos. 1, 2, and 3. The property has been idle since 1920.

Iron Dike Mine. Owner, F. D. Beardsley, c/o A. L. Beardsley, 827 Roosevelt Building, Los Angeles. Location, Sec. 2, T. 25 N., R. 10 E. MacBoyle² described this in 1918. At that time the main tunnel was in 300 ft. and 200 ft. below the surface; and it was said that the tunnel would give 1200 ft. of backs when it struck the vein. This tunnel is

¹ op. cit.

² op. cit.

now in 700 ft. The claims held are called the Sulphide Nos. 1 to 7. It has been idle since 1920.

Littlefield Group. Owners, F. N. Littlefield, G. W. Young and J. H. Weber. Location, Sec. 33, T. 27 N., R. 8 E., on the steep side of the canyon of the North Fork Feather River. The road from Westwood or Greenville to Seneca passes within two miles of this group. Of this last two miles, $\frac{3}{4}$ of a mile is trail and the balance unimproved dirt road. The Littlefield and Rymal Copper Claim and the Big Spring Copper Claim hold 40 acres. A 50-ft. tunnel follows a quartz vein into the east bank of the canyon just a few feet above the level of the water in the river. The country rock is greenstone. Southerly 100 yards and higher on the side of the canyon (100 to 200 ft.) are two more tunnels following quartz veins, each about 30 ft. long. All of these veins carry copper sulphides; and samples from the dumps are said to have averaged 4% copper and \$8 per ton in gold. In the bed of the river, recent erosion has exposed chalcopyrite in the greenstone in large enough quantities to make this an attractive prospect.

Lucky Boy Group. Nothing is known by the writer about the present ownership of this group. It is located on Moonlight flat at the head of Lights Creek north of Engelmire. Six or seven diamond drill holes were put in and some low-grade ore was found, said to assay 4 oz. in silver and 1% copper.

Moonlight. See Trask and Coffer.

Native Son. Owner, G and L Mining Company, 250 Lake St., Reno, Nevada. L. B. Longnecker, president; A. L. Beardsley, secretary. Location, Sec. 24, T. 25 N., R. 11 E. MacBoyle¹ describes this as a quartz stringer vein, carrying chalcopyrite, in a siliceous zone near the contact of slates and altered andesite. It is now equipped with a Fairbanks Morse engine and 6 x 8-in. compressor, also a portable engine and compressor. In 1927, a vertical shaft was sunk 70 ft. at a distance of 150 ft. from the vein, all in andesite. Seven full claims are held: Native Son Nos. 1 to 4, Gertrude and Mary.

Pilot Copper Mine. Owners, A. P. and J. W. Goodhue, Genesee. Location, Sees. 14 and 23, T. 25 N., R. 11 E. in a canyon two miles southeast of Genesee. Veramont Station on the Indian Valley Railroad is 10 miles northwest by a good dirt road. Sixty acres are held by the following claims: Pilot, Pilot No. 2 and Providence. Two fissure veins in Kettle meta-andesite, the Borden and the Mohican, two to four feet wide, carry copper, gold and silver. The Mohican strikes N. 18° W. and dips 44° E.; the Borden strikes N. 6° W. and dips 30° E. A tunnel 600 ft. long cuts the Borden vein 136 ft. vertically below the croppings and 222 ft. below a point on the Mohican vein on which a 30-ft. shaft has been sunk. The tunnel has been driven 55 ft. beyond the Borden vein and should cut the Mohican vein if driven 60 to 75 ft. more. A 30-ft. raise from an 18-ft. drift in the tunnel connects with a stope 18 ft. long by 4 ft. wide by 12 ft. high. A 50-ft. drift has been driven from the shaft on the Mohican.

J. W. Goodhue expects to equip this property with a compressor during the present season and extend development work. A shipment of ore from which $\frac{1}{3}$ was sorted out and saved for a mill grade, the

¹ op. cit.

balancee being shipped, is said to have run 17% copper, \$14.60 in gold and 14 oz. silver per ton. That in the shaft is said to have been a little better in grade. Specimens of the ore show free gold. The last work in the tunnel was done in 1922. The Gruss, Worley group (Green Ledge and Mother Lode) and the Cooper Mine adjoin.

Reward. (Cosmopolitan.) Owner, I. L. Rosenthal, Room 500, 177 Post St., San Francisco. Location, Sec. 3, T. 25 N., R. 11 E., about midway between the Engels Mine and the Walker Mine. Unpatented claims are Greenville, California, Leslie, Fossil, Vulcan, San Francisco and Annex. Three patented claims, Reward, Beckwith and Reno, are held. The total area is 200 acres. The work done in former years has been described by MacBoyle¹ and in Bulletin No. 50 of the State Mining Bureau. Cuts are now to be made 800 ft. northeasterly from the old workings near the center of the Beckwith claim to expose the vein. An automobile road is now being built to the highest point on the group, the Beckwith claim; and a spring of good water is being developed. At the time of visit a small house had just been completed and one man was at work; but later reports indicate that more extensive development is to proceed under the supervision of Allen C. Miller of Quincy.

Ruby Copper Mine. Owner, O. B. Camp, Engelmine. Location, Sec. 13, T. 27 N., R. 10 E., on Moonlight Creek, $1\frac{1}{2}$ miles southwest of Engelmine. It is said that \$50,000 had been spent on the development of this property in 1923. A tunnel 200 ft. long connects with stopes that are said to have a shipping grade of bornite on the face. Equipment consists of a crusher, 5-stamp mill with 30-hp. motor, three tables, and a Calow flotation cell; also a compressor with a 50-hp. motor and a tramway with an air hoist. A connection with the line of the Great Western Power Company brings current to the property at 23,000 volts. O. B. Camp expects to sink on the vein below the tunnel level to prospect it at greater depth.

Trask and Coffer. (Moonlight Copper Mine.) Location, on Moonlight Creek near the Ruby, just described. Owner, C. L. Eaton of the Indian Valley Railroad. Development consists of a 900-ft. tunnel, from which a 100-ft. winze was sunk. Ore has been stoped from the bottom of the winze to the tunnel level. Power is supplied to the property by the Great Western Power Company. Assessment work only is being done.

U. S. Smelting, Refining and Mining Exploration Company. Address, Newhouse Building, Salt Lake City, Utah. This company owns 98 acres of patented claims, Mineral Survey 5551, in Sec. 7, T. 24 N., R. 12 E., and 83 acres, Mineral Survey 5495 in Sec. 12, T. 24 N., R. 11 E. Other unpatented claims are owned, the whole being known as the Lena and Iron Dike group near the Walker Mine. It has been idle for many years.

Walker Mine. Owner, Walker Mining Company, Kearns Building, Salt Lake City, Utah. Anaconda Copper Co. owns 51% of the stock. J. R. Walker is president and J. B. Whitehill is secretary. At the mine, H. A. Geisendorfer is manager; C. D. Arrieta is chief engineer; John Wallbloom is mine superintendent; and M. R. McKenzie is mill superintendent. The mine address is Spring Garden.

¹ op. cit.

Location: Sees. 5, 6, 7, 8, T. 24 N., R. 12 E., and Sees. 29, 30, 31, 32, T. 25 N., R. 12 E. The mine is N. 52° E., nine miles from Spring Garden, a station on the main line of the Western Pacific Railroad, with which it is connected by an aerial cable-tramway. A fair mountain road runs from Portola to the mine, but it is blocked by snow during six months of the year. During that time all passengers and freight are handled on the tramway. The property is in the steep, timber-covered mountains between Little Grizzly Creek and Mt. Ingalls; and the camp is at an elevation of 6500 ft., while other points on the claims reach elevations of more than 7000 feet.

Property: Ten patented claims, Mineral Survey 4865, and unpatented claims to make an area of 1140 acres are held, giving a length along the lode of 6800 feet. Discovery was made about 1904; but important developments did not take place until 1915. MacBoyle¹ describes this early work, and the old mill.

Geology: The geology of this deposit is in many ways similar to that of the Engels Mine, described above. The same contact between the plutonic core of the Sierra Nevada and the Carboniferous rocks runs through this property; and the ore is similar to the disseminated ore of the Engels Mine. Important differences are that here more quartz is associated with the copper minerals, indicating a greater tendency toward vein-forming conditions, and that the ore has not been found in commercial grades in the plutonic rocks, but is always found in a fine-grained, black schist, often containing garnets. A few faults with a maximum displacement of 20 ft. cut the veins; and a quartz-diorite dike is found to displace them 10 feet.

A striking feature of this deposit is that a very extensive and important body of ore has been found a few hundred feet below the surface with indications at the surface that might easily pass unnoticed. While the vein has been followed for more than a mile on the surface, it always looks quite barren. Only white quartz with a little staining of iron oxide is seen; there is no prominent gossan, nor the green and blue staining commonly found above sulphides of copper. Close



Aerial tramway between Walker Mine and Spring Garden. Winter scene, Plumas County.

¹ op. cit.

examination reveals the cavities from which the copper has been leached, but these apparently contain only iron oxides; and chemical tests are required to reveal the presence of copper.

The main orebody has a maximum width of 120 ft. and an average width of 30 ft., the strike being N. 20° to 30° W., and the dip 55° to 75° E.

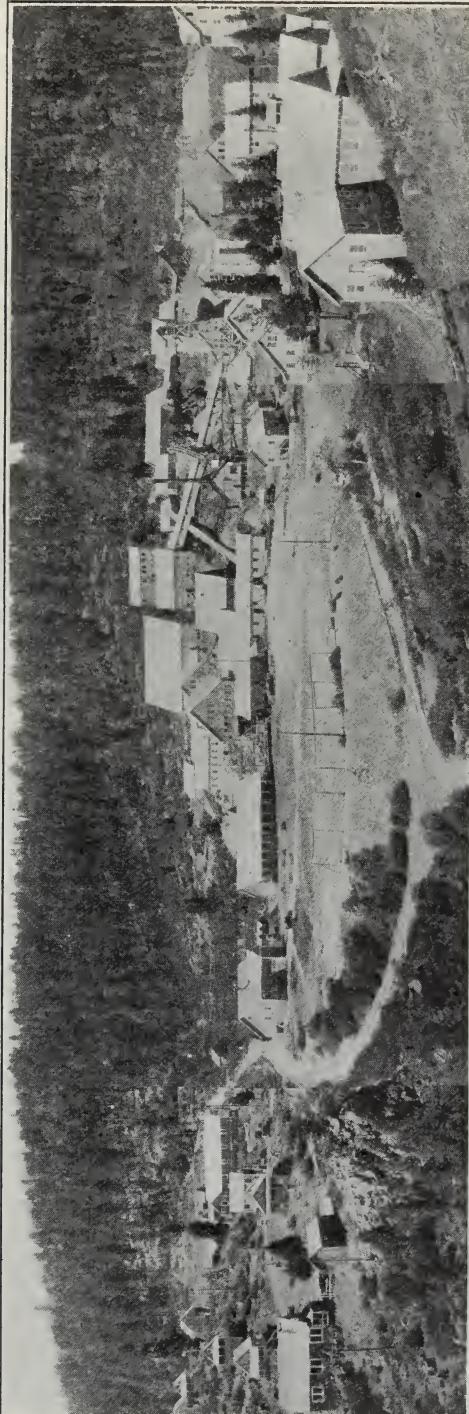
Development: The main haulage tunnel is the 7th level adit, 10,000 ft. long. Starting at the portal of this tunnel, we travel at an angle to the vein for nearly 3000 ft., then turn and follow the vein; at 3000 ft. from the portal we reach the South orebody, 250 ft. long, which is in two parts, main and hanging-wall; 300 ft. more brings us to the Central orebody, 1000 ft. long; 300 ft. more and we arrive at the North orebody, 1000 ft. long; at 8000 ft. from the portal we arrive at the 712 orebody, just being opened up, and with a length of 200 ft.; and at 10,000 ft. from the portal we reach the latest development, the Piute orebody, 800 ft. long, average width 35 ft., and according to a published state-



Tramway at Walker Mine. Photographs by C. D. Arrieta.

ment of J. R. Walker, president, averaging 2 to $2\frac{1}{2}\%$ copper with good gold and silver values. At the Central orebody, we have been 700 ft. below the surface, at the North orebody, 900 ft. below, and at the Piute, 400 ft. below the surface. A raise was being driven from the Piute orebody to the surface at the time of visit, and was nearly complete. An I.R. PR-2 compressor of 1500-cu. ft. capacity was to be installed at the top of this raise to supply the far end of the mine with compressed air. A winze has been sunk 500 ft. on the South orebody from the 7th to the 10th level, and 150 ft. of drifting done on the latter. Another winze 350 ft. deep has been sunk on the Central orebody from the 7th to the 9th level and 900 ft. of drifting done. On the 8th level 600 ft. of drifting was done on the South orebody and 400 ft. on the Central orebody.

All stoping has been done above the 7th level, and the sizes of the stopes, length, width and height, are as follows:



Plant of Walker Mining Co., near Spring Garden, Plumas County.

South footwall orebody-----	250 by 20 by 300 ft.
South hanging-wall orebody-----	400 by 6 by 200 ft.
Central orebody-----	800 by 30 by 700 ft.
North orebody-----	1200 by 40 by 700 ft.

The 712 and Piute orebodies have not yet been stoped, and much ore is still available from the North orebody. Ore reserves are: positive, in place, 863,067 tons of 2% copper; positive, broken, 150,000 tons of 1.5% copper; probable 621,666 tons of 1.79% copper. Ore containing 1% copper is not considered, because it can not be stoped at the present price of copper; but much ore of this grade has been developed and possibly will become available later. Shrinkage stopes with sublevels 30 to 36 ft. above the 7th level are used to extract the ore. There is a grizzly over each chute at the sublevel. The ore is hard and stands well, and very little timbering is required. Good ore continues to the lowest levels explored; and it seems reasonable to expect that an orebody of this length will reach much greater depths.

Equipment: Two 5-ton and three 3-ton trolley locomotives with 25 3-ton cars are used on the main haulage. One-ton cars are used on other levels. Two double-drum hoists with $1\frac{1}{2}$ - and 1-ton skips are used on the winzes; and three single-drum hoists are used on raises to hoist men and tools. Five compressors furnish a total of 3000 cu. ft. of air per minute through 8000 ft. of 6-in. pipe on the 7th level. An idea of buildings in use, such as boarding houses, bunk houses, offices, store houses and cottages is obtained from the photograph. New equipment, soon to be installed, includes 10 cottages and a large electric motor for the main haulage level.

Mill and Tramway. The mill includes the following: Blake crushers, one 15 x 24 in., two 8 x 20 in.; two sets rolls 25 x 55 in.; revolving screens, 2-in. and 1-in. mesh; 3 No. 75 Marcy ball mills, each with Dorr classifier; 3 sets Calow cells, rougher and finisher; 25-ft. Dorr thickeners; Oliver filter, 12 ft. x 8 ft. The process is similar to that used at the Engels Copper Mining Company, for which a flow-sheet is given above. The capacity of the Walker mill averages 1000 tons per day, although it was designed for a smaller capacity. In 1927, 347,566 tons were milled. The total, including 1927, is 1,336,275 tons containing 69,356,602 pounds of copper. Gold averages 0.05 oz. and silver 1 oz. per ton. Concentrates are sent to Spring Garden over the 9-mile aerial tramway, having a $1\frac{1}{2}$ -in. main cable, a $\frac{7}{8}$ -in. return cable, and $\frac{3}{4}$ -in. traction cable and 104 buckets holding 700 pounds each. Smelting is done at Tooele, Utah.

Costs: Very little information on costs was available at the mine. The following is from a statement of the president, J. R. Walker, published in the Salt Lake Tribune, May 13, 1928. Earnings are \$250,000 per year net on mill-heads going less than 1.4% copper plus gold and silver values. Mill-heads are low on account of the large amount of development work being done. All ore broken in development work is put through the mill if it will run 0.5% copper. Ore of this grade contains \$1.40 per ton in copper, at a price of 14¢ per lb., with gold and silver in addition, while milling charges are less than 60¢ per ton. Development is costing more than \$150,000 per year. A large amount of diamond drilling is being done to crosscut the entire ore-zone which

is over 400 ft. in width. At present metal prices, the gross value of the output is over \$1,800,000 annually. From 300 to 325 men are employed.

GOLD (Lode Mines)

Arcadian. Owners, L. P. McIntyre, D. J. McIntyre and J. A. McIntyre of Greenville. Location, Secs. 10 and 15, T. 26 N., R. 9 E., one mile south of Greenville. Since MacBoyle's¹ report, 150 ft. of drifting has been done on the Savage vein at a distance below the surface of 350 feet. This is on a newly developed portion of the vein beyond a fault, the new segment striking north with a vertical dip.

The ditches and pipe that furnished water-power to run the old mill are out of repair; and a Straub mill of a rated capacity of 10 tons per hours is in use. 700 tons of ore from dumps and 500 tons from a stope 80 ft. long and 18 in. wide have recently been milled, the average value being \$4.50 per ton. Other equipment consists of a compressor driven by a 25-hp. gasoline engine and a 5-hp. engine to drive the mill. Claims held are called the Mohawk, Gold Zone, Belmont, Midway and Adventure, area 100 acres. J. A. McIntyre and August Forthaus are working the property under a lease.

Austrian Syndicate. c/o A. B. Hill, Jr., 201 Sansome St., San Francisco. Location, Secs. 13, 14, 23 and 24, T. 25 N., R. 11 E., on the copper belt, midway between Walker Mine and Genesee. The group contains five patented claims, 100 acres, Mineral Survey 4535. Old workings developed quartz veins containing copper and gold. No work has been done recently.

Broken Back Mine. Owner, W. H. Duncan, Bucks, via Meadow Valley. Location, Sec. 3(?), T. 22 N., R. 7 E., six miles due south of Bucks, from which it can be reached by a fair mountain road. A 240-ft. tunnel has been driven on a 10-ft. quartz vein, of which 4-ft. is said to sample \$12 in free gold. The face of the tunnel is 150 ft. below the surface. A mill on the property of three 950-lb. stamps and plates was run by means of water-power from Pigtail Creek. This has not been used for ten or fifteen years and is in bad repair.

Butterfield and Paddock. Owners, F. L. Butterfield and A. H. Paddock of Spring Garden. Location, Sec. 19, T. 24 N., R. 11 E., five miles north of Spring Garden. The group consists of the Ohio and the Aurora claims, and is developed by a 500-ft. tunnel. Small high-grade veins containing gold are found; and the ore is put through a 2-stamp mill run by a gasoline engine. The property was worked early in 1928, but was idle at the time of visit to the district.

Crescent Hill Con. Gold Mines Co. of California. Owner, same company, c/o Mrs. A. J. C. Oddie, vice-president, Quincy. Location, Secs. 11, 13 and 14, T. 23 N., R. 9 E., seven miles south of Quincy. The first six miles is wagon road and the last mile is mountain trail. The mine is on the north side of the canyon of the Middle Fork Feather River, a region well supplied with water and timber. The group consists of 62 acres of patented claims, Mineral Survey 4744, and four adjoining unpatented claims. It was acquired by the present owners in 1908, was worked until 1915, and was then shut down on account of the high costs following the war, and has since been in the hands of a caretaker.

¹ op. cit.
3—63083

Two quartz-filled fissure veins have been developed on a contact between amphibolite and serpentine. The strike is northwest and the dip is 80 degrees. The ore contains free-milling gold near the surface, but sulphides below. An upper tunnel 900 ft. long reaches a depth on the vein of 430 ft., while a lower tunnel follows the vein for 850 ft. with 350 ft. more to go to reach a point under the face of the upper tunnel. A raise 180 ft. long connects the lower and upper tunnels; and raises of 100 ft. and 240 ft. show ore from the upper tunnel to the surface. Three stopes average 100 ft. long, 40 ft. high and $2\frac{1}{2}$ ft. wide. Ore reserves are said to be: 12,000 tons of \$8 to \$25 ore, and 47,000 tons of \$7.50 to \$12 ore; and a face sample is said to have assayed \$12.27 per ton. The figures just given are for the main vein. On the sister vein a shoot of ore 200 ft. by 5 ft. is said to contain 7000 tons of \$4 to \$16 ore.

Equipment consists of a bunk house, cook house, office, powder house and barn. The office building contains a laboratory and bedrooms. There are also 3500 ft. of track, two steel ore-cars and a saw-mill. Ore is treated in a mill containing a crusher, chilean mill, and Wilfley table, all driven by a gasoline engine. Only test-runs have been made in the mill, production being \$11,000 on ore averaging \$10 per ton.

Crescent Mine. Owner, Crescent Mill and Mining Company, c/o A. H. Redington, Mills Building, San Francisco. Location, Sec. 24, T. 26 N., R. 9 E., at Crescent Mills. The property consists of 105 acres of patented land, 80 acres being timber-land. The last work was done under the supervision of Albert Burch. A shaft had already been sunk to the 400-ft. level. This was continued to the 600-ft. level; and a large amount of drifting and cross-cutting was done on the 400, and some on the 600. The vein was poorly defined; and no ore was found that would assay above \$2 per ton. Later a winze was sunk from the 200-ft. level and the ore appeared to bottom 30 ft. below that level.

Crown Point Mine. Owner, Mrs. C. J. Lee, Quincy. Location: Sec. 19(?), T. 24 N., R. 11 E., four miles north of Spring Garden. Locations cover 200 acres. A fissure vein with a maximum width of 3 ft. and an average width of 1 ft. has been followed to a depth of 600 ft. by means of a shaft with levels every 50 to 75 feet. The vein has been stoped out, with the exception of that portion developed by the last 100 ft. of shaft. The vein is in greenstone, and strikes northeast with a dip of 45° to the southeast. Ore of a gross value of \$20,000 was extracted in 1927 and 1926. This is said to have averaged \$45 in gold per ton. Equipment consists of a compressor run by a 40-hp. distillate engine, hoist of 1000 lbs. capacity, bunk house, boarding house and a 10-stamp mill with plates.

Davison Group. Owner, L. A. Davison, Box 483, Napa. Location, Sec. 19, T. 22 N., R. 7 E. This property was not visited by the writer. Eight claims are held. Several fissure veins containing gold, silver and copper with widths of from 2 to 5 ft. are said to have been developed by means of six tunnels of a total length of 1800 feet. A list submitted by Mr. Davidson shows the assay returns from 37 samples to average \$55 in gold and silver, but the width represented by each is not stated.

Dodge and McAtee Group. Owners, C. O. Dodge, J. O. McAtee, E.

V. McAtee, Vernon McAtee, Harry C. Suender, Geo. M. Sparks, J. B. Post and G. C. Post of Oroville. Location, Sec. 31, T. 23 N., R. 7 E., about six miles south of Letterbox on the Oroville-Quincy road. The road is a fair mountain highway from Oroville to a mile beyond Letterbox; the last five miles is very rocky and rough. Coquette and Cold Water creeks cross the group of seven claims.

On the steep side of the canyon about 200 ft. above Cold Water Creek, an incline shaft 20 ft. deep exposes a vein $3\frac{1}{2}$ ft. wide striking S. 60° W. with a dip of 53° to the southeast. Copper and iron sulphides may be seen in this quartz, also cavities from which sulphides have probably been leached. Below, nearly at the level of the creek, what is apparently this same vein, although there is considerable variation in dip, is exposed by cuts in both walls of the canyon. On one side the main vein is 2 ft. wide, but there is a stringer on the hanging-wall side 1 ft. wide. On the other side of the canyon the vein narrows to about 8 inches, and where the creek has cut through it, the width is 1 foot. The quartz contains copper and iron as sulphides in all of these exposures. The country rock is a basic, green rock, probably andesitic, which in spots contains coarse crystals of hornblende.

About a mile northerly from the workings just described, and on the opposite end of the group of claims, several shallow pits have been excavated on a vein averaging 2 ft. or less in width, striking S. 65° W. with a dip of 60° to the northwest. The pits are located at intervals of 100 feet along the vein or veins. In one of them, the dip is in the opposite direction, and it is probable that two or more veins exist here. The mineralization is different from that described above; there is a large amount of black stain, probably manganese oxide, but no sulphides of copper. Samples from this vein are said to have given very good returns in gold.

Droege Mine. Owner, Lindblom Investment Co., Hotel Claremont, Berkeley. Location, Secs. 9, 10, 15 and 16, T. 26 N., R. 9 E., $1\frac{1}{2}$ miles south of Greenville. MacBoyle¹ described this property in 1918. At that time it was under lease to John W. Daley, and ten stamps were in operation on ore averaging \$5 per ton. The mine was then developed by three tunnel levels. The deposit consists of lenticular fissure veins in meta-rhyolite, granodiorite and serpentine.

W. Parsons of Greenville leased this property in 1924 and 1925. He drove ahead 500 ft. in the No. 4 tunnel, which is 400 ft. vertically below the No. 3. The No. 4 is now 1400 ft. long, all in granodiorite, and has not yet cut the vein. A resurvey is soon to be made. In 1927, a drift of 30 to 35 ft. was driven on the John Bull vein, which has a width of 18 to 20 inches. All mechanical equipment has been removed from the property.

Gold Leaf Mine. Owners, J. J. McKay, Spring Garden; Dr. H. H. Look, Sacramento; W. D. Stone, Long Beach. Location, Secs. 19, 20, 29 and 30, T. 24 N., R. 11 E., five miles north of Spring Garden. Seven patented claims, Mineral Survey 5706, and unpatented claims to make a total of 170 acres are held. A drift 1800 ft. long with a 100-ft. raise to the surface has developed a quartz-stringer zone in schist, which is 48 ft. wide on one end and 25 ft. wide on the other, with a length of

¹ op. cit.

240 feet. This ore is said to contain \$5 per ton in free-milling gold, and 1% to 1½% of sulphides worth \$159 per ton. Production in 1926 and early 1927 amounted to \$6,000.

Equipment consists of a compressor 8 x 10 in., crusher, 40-ton Lane mill, and a Deister slime table. These are operated by means of water-power. A water right on Greenhorn Creek capable of developing 600 hp. is owned. The property is now idle and is in litigation.

Gold Stripes Mine. Owner, Cassie M. Hamilton, Oroville. Location, Sec. 36, T. 27 N., R. 8 E. and Sec. 1, T. 26 N., R. 8 E., five miles northwest of Greenville by a steep mountain road. Three patented claims have an area of 48 acres. From 1882 to 1913, this mine produced \$750,000 from a fissure vein near a contact of slate and serpentine, but these old workings have all caved.



C. E. Wardlow's mill at Gold Stripes Mine.

At present C. E. Wardlow of Greenville has a lease on this group, and is running 7½ tons per day of \$5 to \$12 ore through a Huntington mill with plates. A 12-hp. gasoline engine drives the Huntington, and an 8-hp. engine drives a crusher. The ore is obtained from a flat blanket-deposit in the slate near the surface, and is composed of mixed quartz and slate. This deposit has been traced for a distance of 800 ft. Three men are working.

Green Ledge and Mother Lode. Owner, Mrs. Florence Worley, Hotel Sutter, Yuba City. Location, Secs. 14, 15 and 23, T. 25 N., R. 11 E., near Genesee. This is a combination of two old groups, which have been held for many years without active development. Early work resulted in the production of small lots of ore containing good values in copper, gold and silver from quartz-filled fissure veins in schist and andesite. MacBoyle¹ describes these early operations.

¹ op. cit.

The group now consists of the following claims: Green Ledge, Key Stone, Baltimore, Little Joe, Evening Star and Gold Fish. Negotiations are said to be under way for patent on all of these claims but the Green Ledge. At the time of visit on June 25, 1928, one man was just starting to clean up and to do assessment work.

Green Mountain Mine. Owner, Harold Boericke, 1310 Packard Building, Philadelphia, Pa. Location, Secs. 23 and 24, T. 26 N., R. 9 E., at Crescent Mills. The ground is patented, and has an area of 96 acres partly covered by Mineral Survey 5610. From 1860 to 1890, the mine is said to have produced \$1,000,000 to \$2,000,000 from a quartz vein near the contact of slate and altered igneous rocks, serpentine and meta-rhyolite.

The last work was done under the supervision of Albert Burch. An ore-shoot was found of a length of 150 ft. which had been stoped upward from the Green Mountain tunnel. It had a good width and an average value of \$12 per ton in gold. A winze was sunk on the vein 450 ft. at an inclination of 50°, and drifting was done at 150 ft. and also at 450 feet. The ore-shoot appeared to divide into two short tongues at 150 ft. and was not found at all at the 450-ft. level.

Harriman Group. Owner, J. W. Harriman, 919 Gaviota Ave., Long Beach. Location, Sec. 28, T. 27 N., R. 11 E., 16 miles north of Vermont station on the Indian Valley Railroad, from which it is reached by a very steep and rough mountain road crossing Kettle Rock at an elevation of 7800 feet. A Mrs. Wagener is said to have done 200 ft. of work on a 4-ft. stringer zone, and to have milled some ore at a mill one mile south of the property, which has since been dismantled. The workings are now caved, and in one of the holes resulting from the caving a 4-ft. width of quartz stringers in granite or granite porphyry may be seen. The only recent work consists of two shafts 6 ft. and 10 ft. deep exposing quartz stringers from 2 in. to 6 in. wide in the bed of the creek. Equipment consists of a Fordson tractor with hoist attached and a pump driven by a $1\frac{1}{2}$ -hp. gasoline engine.

Hazard Quartz Mine. Owner, Mrs. Eva Baker, No. 4 Arcade Building, Reno, Nevada. Location, Sec. 15, T. 26 N., R. 8 E., one mile east of Seneca. MacBoyle¹ describes this as a dike of fine grained rock brecciated and recemented by quartz carrying auriferous sulphides, pyrite and arsenopyrite. Only one tunnel is open, the Seneca-Eureka, which is in 700 ft. and has cut some stringers. A crosscut from this tunnel would give 300 to 400 ft. of backs on the Bear vein. During recent years, work has consisted only of keeping this tunnel open, and of surface cuts.

Hinchman Mine. Owner, Genesee Con. Mines Co.; for officers and address of this company see 'Big Cliff' under copper mines. Location, Sec. 6, T. 25 N., R. 11 E., two miles northwest of Genesee. The deposit consists of a fissure vein, containing gold, silver and copper, near the contact of sandstone and meta-andesite. A tunnel now in 500 ft. should strike the vein at a distance of 300 ft. below the outerop. It has been idle since 1920.

¹ op. cit.

Hose Mine. Owner, W. H. Duncan, Bucks, via Meadow Valley. Location, Sec. 26, T. 23 N., R. 7 E., eight miles south of Bucks, from which it is reached by a rough mountain road, the last half mile being a steep trail down the west side of Willow creek canyon. A tunnel about 150 ft. long strikes a vein of which the course is S. 57° W. and the dip vertical. Ore has been stoped from this vein, which is said to be 4 ft. wide in the stope, but this was inaccessible at time of visit. The drift from this upper tunnel is 150 ft. long; and the vein has pinched to a width of only a few inches in the face. A shaft from the drift, 50 ft. or more deep, was also inaccessible. A lower tunnel, about 150 ft. below, is in country rock (andesite?), but a crosscut strikes a vein at a distance from the tunnel of 30 ft. The strike is S. 71° W. and the dip vertical, so this may be the same vein as that in the upper tunnel. Here it appears as a 2 ft. stringer zone. Ore on the dump of the upper tunnel shows a plentiful sprinkling of chalcoyprite in white quartz, and is said to carry good values in gold. An attempt has been made to recover the gold in this ore by amalgamation on plates in an old 10-stamp mill on the property, water from Willow Creek under a head of 100 ft. being used for power. Two men were working the property under lease at time of visit, but no production had yet been made.

Jackson Group. (Whitney.) Owners, J. W. Ryan, Crescent Mills; Samuel Altshuler, 333 Kearny St., San Francisco. Location, Secs. 13, 14, 23 and 24, T. 26 N., R. 9 E., two miles west of Crescent Mills. The steep mountain road that reaches the mine is at present washed out. With some repairs, it can be put in condition for travel by trucks.

This property includes claims formerly held by A. W. Whitney, but the group has been extended to cover 135 acres. A newly developed vein 25 to 30 ft. wide, containing quartz and sulphides with values in gold, strikes northwest and dips 80° southwest. Four tunnels have been driven on this with drifts on the vein as follows: lowest 180 ft., 30 ft. above 55 ft., 30 ft. above 40 ft., and 60 ft. higher 60 ft. of drift. The next tunnel to the highest is a 90-ft. crosscut, from which the 40 ft. of drifting has been done. This work, together with surface trenches, is reported to have developed a body of ore 300 ft. long, 120 ft. high and 15 ft. wide, containing \$10 in gold; but further work will probably be required to actually prove these dimensions. Other known veins on this group include Munroe, Hudson and Big Fissure. Equipment consists of a two-drill compressor driven by a gasoline engine, 2000 ft. of rails, 2 ore cars and two blacksmith shops. Two men were at work at time of visit.

Lucky S. Owner, Harriman-Blakeman Corporation, 27 Williams St., New York City; Lyman Sessen, secretary. J. W. Harriman, Taylorsville or 919 Gaviota Ave., Long Beach, is in charge of the mine. Location, Secs. 28 and 33, T. 27 N., R. 11 E., 16 miles north of Veramont station on the Indian Valley Railroad, from which it is reached by means of a very steep and rough mountain road crossing Kettle Rock at an elevation of 7850 feet. Report XIII of the State Mining Bureau for the two years ending Sept. 15, 1896, describes work on two veins 4 ft. and 6 ft. wide. Holdings consist now of 1200 acres, four quartz claims, the balance placer. Eight ounces of gold are said to have been recovered this season from assessment work on the placer claims. New work on the quartz claims consists of a 10-ft. shaft exposing a 2 to 6 in.

stringer of quartz in the bottom. Water for placer mining is obtained from melting snows in the spring. Cabins are the only equipment. An effort is being made to finance this property at the present time.

Martin and Nicoll Prospect. Owners, Geo. T. Martin and A. J. Nicoll, Box 664, Susanville. Location, Sec. 35, T. 27 N., R. 8 E., on Clear Creek. From Greenville, a fair mountain road runs to the Gold Stripes Mine; from there, this prospect can be reached by a mile of trail. Two locations hold 40 acres. This deposit was discovered as a result of attempts to find the source of the gold that formed the Clear Creek placers, which were mined years ago. The vein (or veins) is exposed on the west side of the creek and from 100 to 300 ft. above it. Surface cuts, of which the deepest is 9 ft., have been made at intervals for a distance of 500 feet. Eight cuts average 5 to 6 ft. deep and there are numerous smaller ones. The strike and dip in the various cuts is irregular; and more than one vein may be exposed. An approxi-



Mill of Pacific Foundation Corporation near Spring Garden.

mation is N. 10° W., dip 40° W. The country rock is slate. Samples of \$96 to \$100 in gold across $3\frac{1}{2}$ to 4 ft. are said to have been obtained. A north and south belt of serpentine, from which chromite was mined during the war, lies about 300 ft. east of the workings.

Mountain Lion. Owner, Genesee Con. Mines Co. For officers and address of this company see 'Big Cliff' under copper. Location, Secs. 15 and 22, T. 25 N., R. 11 E., two miles south of Genesee. MacBoyle¹ describes this as a quartz vein containing values in copper, gold and silver with walls of meta-andesite. His figure for gold, \$400, was intended to read \$4. The tunnel was in 750 ft. at the time of his report. It is now in 800 ft. The property has been idle since 1920.

Native Son. See under 'Copper.'

New York Mine. See 'Plumas Gold Mining Company.'

¹ op. cit.

Pacific Foundation Corporation. See under 'Placer' also. Directors, E. L. Flanagan, 2345 Spurgeon St., Santa Ana, Calif.; V. L. Tracy, 3919 Beverly Blvd., Los Angeles; A. W. Ham, Las Vegas, Nevada. M. H. Whitaacre, superintendent, 1069 40th St., Sacramento, is in charge at the property. Location, Sec. 19(?), T. 24 N., R. 11 E., five miles by a fair mountain road northerly from Spring Garden. At the time of visit one 100-ft. tunnel, two cuts about 12 ft. long, and a few surface cuts 2 ft. wide and 2 ft. deep constituted the only development. These exposed quartz stringers in a weathered and decomposed schist. The surrounding ground shows evidence of former extensive hydraulicking operations, but this is now overgrown with trees up to 20 ft. high.

A mill, practically completed, was under construction at the time of visit. It consists of the following: grizzly on which mine cars are to be dumped; below this an Allis-Chalmers gyratory crusher, 6-in. feed, capacity 4 tons per hour; bin for crushed ore; Challenge feeder to a Joshua Hendy rapid discharge ball mill 5 ft. x 4 ft., capacity 75 tons through 30 mesh screen. The operators expect to put 150 tons per day through a 20 mesh screen. Three 5-ft. x 8½-ft. amalgamating plates take the discharge from the ball mill. A 75-hp. Fairbanks Morse Diesel engine is in place to drive the mill. The water supply had failed in July, but arrangements were being made to obtain a supply from the water right of the Gold Leaf Mine.

Plumas Eureka Corporation. Owners, Phillips Trustees, A. J. Peters, Chief Trustee, No. 1 Federal St., Boston, Mass. The president is W. W. Dickson and the secretary is V. L. Sawyer. C. D. Stark is in charge at the mine at Johnsville. Location, Sees. 2, 11, 12, 13, 14, 22, 23 and 26, T. 22 N., R. 11 E., at Johnsville, six miles west of Blairsden on the Western Pacific, with which it is connected by a good graveled auto road. The property consists of 2584 acres of patented ground, including 600 acres of virgin commercial timber, and 160 acres of unpatented claims. Elevations vary from 5500 ft. to 7400 ft.

The Plumas Eureka is an old mine, which has been described at some length in earlier reports of this Division, particularly Report VIII and the Plumas County report of 1918, by MacBoyle. C. D. Stark estimates the production since 1872 at approximately 1,000,000 tons which yielded \$8 per ton by amalgamation; and he thinks that there was a large loss in the tailings because of the small size of plates used. Operations were started in 1851, but no record of production is available for the early operations. The ore comes from a complex system of veins, the Eureka having a dip of 75° and several others being almost horizontal. The geology is also complicated, with the following rocks occurring on the property: quartz porphyry, gabbro, diorite, limestone and Calaveras slates.

The last period of operation was from 1916 to 1925. A raise was started from the face of the 7300-ft. Eureka tunnel, the intention being to crosscut the country for a distance of 1100 ft. and connect with the '76' workings above. The raise was driven a distance of 534 ft. in highly silicified quartz porphyry, and at this point broke into old workings on the Mohawk flat vein, and was discontinued. The raise was inaccessible at time of visit, all timbers having fallen out. On this vein 40,000 tons of ore are said to be developed, which will yield \$7.73 on the plates and \$1 per ton in auriferous galena and pyrite. During

the last period of operation, 1100 tons of ore were treated in the mill as tests only.

Equipment consists of a 780-cu. ft. Franklin compressor driven by a 6-ft. Pelton wheel under a head of 90 ft., drill sharpener, 14 machine drills, cars and 26 miles of track. In the old mill building, 20 stamps are still in place, and larger plates and three No. 3 Wilfley tables have been added. A 17½-kw. lighting generator is driven by water power. The main water supply is derived from Jamison Creek through four miles of flume under a head of 260 feet. Water to run the compressor comes from the same creek through 1½ miles of ditch. The buildings and the flume are in poor repair.

Much virgin ground that could be reached by means of a lower tunnel remains unexplored. In the light of the past production of the property, this ground seems worth prospecting.

Plumas Eureka Annex Mining Company. (Jamison Mine.) Owner, same company, N. M. Srdanovich, president, Johnsville. Ed. Richards is secretary. Location, Secs. 25, 26 and 27, T. 22 N., R. 11 E., at Johnsville, six miles west of Blairsden on the Western Pacific, with which it is connected by a good graveled auto road. The property consists of the old Jamison group, to which claims have been added to make a total of 421 acres of patented claims and 470 acres of unpatented claims.

The Jamison is an old mine discovered in 1888. Gold ore has been produced from quartz fissure veins in diorite. MacBoyle¹ gives the production to Nov. 1, 1913, as \$1,358,925. N. M. Srdanovich claims to have records showing a total production of \$6,000,000, the production by lessees since 1919 being \$300,000. The main workings are from a shaft to which a drain tunnel has been driven at the 170-ft. level.

Since 1926, a 500-ft. winze has been sunk on the West vein from an upper level, making the bottom 250 ft. below the drain tunnel. At the bottom drifts were run 230 ft. south and 680 ft. north, and an 18-ft. raise was put up from the north drift. The vein strikes northerly and southerly and dips 65° west. N. M. Srdanovich says that this work blocked out probable ore to the amount of 340,000 tons of a value of \$8 per ton; but additional work would seem to be required to really develop such a block. At the time of visit, water stood 300 ft. deep in the winze. The drain tunnel was caved by a flood last winter due to the breaking of a flume designed to carry off flood waters; and this damage will probably have to be repaired before the water can be pumped out of the winze.

Mine equipment consists of two compressors, one capable of supplying 15 drills, the other 5 drills, and a double-drum hoist handling one ton on each side. Numerous buildings, office, bunk houses, etc., appear to be in good condition. In the mill, 15 stamps are complete with amalgamating plates, the other 5 stamps are in poor repair. All machinery is driven by water power derived from water rights on Grass, Rock, Jamison and Wades lakes. One mile of ditch runs from Grass Lake to a reservoir 540 ft. above the mine; and 1500 ft. of 22-in. pipe brings the water down the hillside.

At the time of visit, three men were running through the mill 150 tons of ore that had been left in the bins. No work was being done in the mine.

¹ op. cit.

Plumas Gold Mining Company. (New York Mine.) Owner, same company, A. W. Wickham, secretary, Philadelphia. W. Parsons is in charge at Greenville. Location, Secs. 10 and 15, T. 26 N., R. 9 E., at Greenville. Crescent Mills on the Indian Valley Railroad is five miles south. Various claims and groups have been combined with the old New York mine to form this property, which now has a total area, patented and unpatented claims, of 1230 acres.

Development consists of about 10,000 ft. of workings on five different tunnel levels. The lowest of these, No. 4, has been driven during the past eight years, and includes 1600 ft. of crosscut and 160 ft. of drift. Gold is found in quartz filled fissure veins in diorite, of which five are said to have been developed.

A new mill was built in 1927. It includes the following: Joshua Hendy rod mill, capacity 50 tons per 24 hours; Mat-o-gold rubber mats for amalgamation; Deister sand table; Deister slime table; 6 x 9-in. crusher. A compressor of seven drills capacity is driven by a 100-hp. motor. There is also a drill sharpener. All machinery is electrically driven by power purchased from the Indian Valley Light and Power Company, which is supplied by the Great Western. Ore from development work amounting to 35 tons per day was treated in the mill for two months in 1927. At the time of visit the property was idle, but some work was being planned for this year.

Reising. Owners, H. C. Flournoy, Quincey; and Estate of Jerry Uslenghi. Location, Sec. 9, T. 25 N., R. 8 E.; north of Virgilia on the Western Pacific, from which it is reached by two miles of wagon road and two miles of trail. The property consists now of a single patented claim, the Reising, Mineral Survey 5038. MacBoyle¹ has described this at some length. The deposit consists of two large lodes, Upper lode 123 ft. wide, Lower lode 157 ft. wide, with 150 ft. of country rock intervening. Quartz stringers in schist form these; and the quartz contains pyrite and oxides of iron that have been derived from the oxidation of pyrite. Samples taken across the whole width of these lodes returned a little over \$1 per ton in gold, but places could, no doubt, be selected that would give better samples than this over considerable widths. A small production of coarse angular gold has come from washing the surface soil just above Rush Creek. This has led to some recent prospecting for the source of the gold higher up on the steep side of the canyon.

Rich Gulch Consolidated Gold Mines. Owner, Joseph Moss Little, 3621 Broadway, Oakland. Location, Secs. 1 and 12, T. 25 N., R. 7 E., four miles northwest of Virgilia by good wagon road. The new highway now being built along the North Fork of Feather River will make this property more accessible. Vehicles used on the road between the mine and Virgilia must now be shipped in by rail. One claim is held by location, and 107 acres are patented. The vein is a quartz filled fissure in slate. It was observed where a small gulch cuts through it; and showed 12 ft. of quartz then 12 ft. of slate, then a stringer zone from a few inches wide to 4 ft. This stringer zone is said to carry very good values in gold. The strike is northwest, and the dip is 70° to the southwest; and the vein can be traced for several miles through this property, the adjoining Halstead and other claims. Placer gold

¹ op. cit.

was mined from this property in 1850. Later the quartz vein was developed by means of three tunnels, but the vein could not be observed in these at time of visit on account of caving. The mine is now idle.

Shaffer Gold Mining Company. Owner, C. B. Shaffer, 33 S. Clark St., Chicago, Ill. Location, Secs. 9, 10, 11, 14, 15 and 16, T. 26 N., R. 8 E., on the North Fork of Feather River at Seneca. The property is a consolidation of several groups including the White Lily and Del Monte, and was formerly known as the Seneca Consolidated Mining Company. Patented claims, Mineral Surveys 4824, 5223, 5218, 5382, have an area of 667 acres, and unpatented claims are held to make the total about 760 acres. Keith Miller is in charge at Seneca.

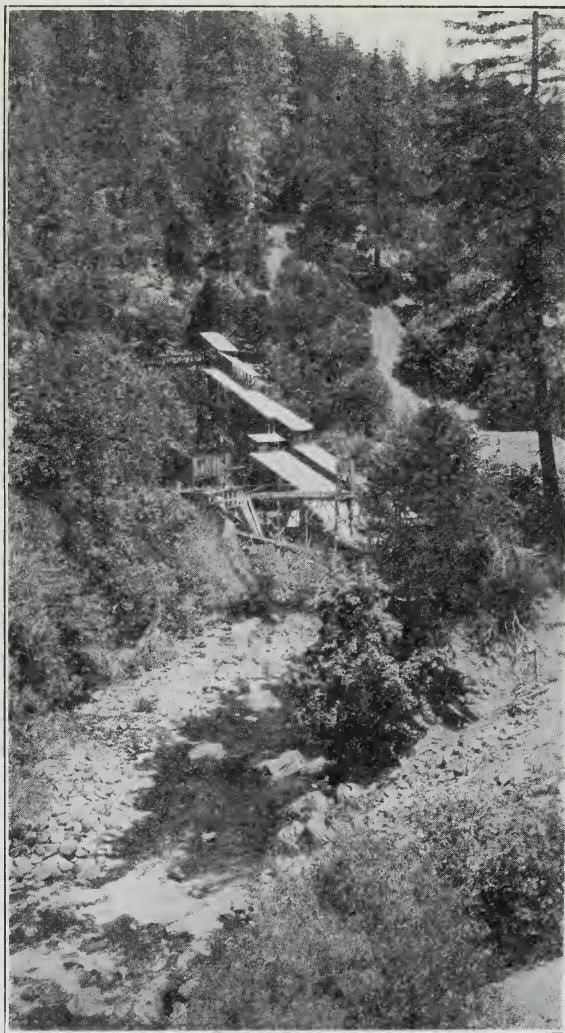
Old work consisted of a tunnel 5190 ft. long, which passed through black slate, porphyry and greenstone. At a distance from the portal of 2500 ft., this tunnel cut a vein of base ore 50 to 60 ft. wide running \$6 per ton. On each side of the tunnel, 600 ft. of drifting was done, and short crosscuts were driven from the drifts to expose the walls of the vein. The strike of the vein is northwesterly and the dip is nearly vertical. From the point in the tunnel where this vein was cut to the surface above, the distance is 800 to 900 ft. In May, 1927, lessees milled some \$16-ore from this vein and cleaned up \$600; but the 10-stamp mill, which uses amalgamation only, did not save all of the gold in this ore. This old tunnel on the White Lily claim is now caved to within 100 ft. of the portal.

Present work is being done at a point north and east of the tunnel just described, and is on the Del Monte claim at an elevation 134 ft. higher than the old tunnel. Two men were driving this tunnel on contract at the time of visit, and were in 800 ft. The tunnel passes through greenstone and diorite for the first 400 ft.; the balance follows a strong gouge with crushed quartz on the right side that pans well in free gold. Keith Miller, superintendent, estimated that his pannings of this ore indicated a value of \$40 per ton.

The 10-stamp mill, a compressor and an electric lighting generator are run by water power from the North Fork under a head of 30 ft. The water right of 106 cu. ft. per second was recently upheld in litigation with the Great Western Power Company.

Shenandoah Mine. Owners, J. W. Schulze of Rich; Geo. H. Pearce, 1263 N. Pilgrim St., Stockton. Location, Sec. 28, T. 25 N., R. 7 E., one mile south of Rich, a station on the Western Pacific, from which the mine is reached by a mile of steep mountain trail. An old road used for construction of the railroad could be repaired to give access to the mine. Five claims hold 100 acres. The deposit consists of a quartz stringer zone in silicified slate. The lower tunnel of the old workings goes in 100 ft., where there is a 30-ft. drift on a vein 2 ft. to 4 ft. wide with a northwesterly strike and a dip of 45° to the southwest. An open cut 100 ft. above this shows irregular bunches and stringers of quartz, some with the general strike and dip of the vein below, some with other strikes and dips. The country rock (probably originally slate) shows heavy silicification for a width of 6 feet. Twenty feet east of this cut is a tunnel 25 ft. long with a small underhand stope, which is said to have recently produced \$2,000 worth of high-grade ore. Another 100 ft. higher, a cut, exposes quartz stringers following the bedding planes of the slate over a width of 20 ft. These are 2 in. to 6 in. wide

with occasional kidneys several feet wide. The strike is S. 70° E., and the dip 75° south. Still higher on the side of the canyon, about 100 ft., is 2 ft. of quartz with strike S. 33° E. and dip 61° east. A tunnel starts on this but runs nearly east, and leaves the quartz. Workings on this level total 300 ft. All distances used in this description are only estimates. An old 10-stamp mill formerly operated by water



Mill of Shaffer Gold Mining Company.

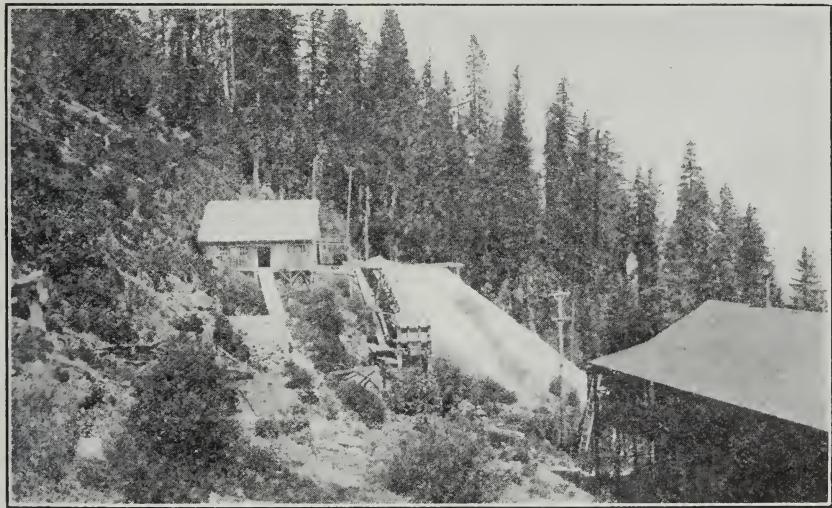
power from Clear Creek has not been used for many years. A small Ellis ball mill driven by a $1\frac{1}{2}$ -hp. gasoline engine has been used to treat the high-grade ore. A blacksmith shop and a house complete the equipment.

Standart Group. (Southern Eureka.) Owner, F. J. Standart, Greenville. Location, Secs. 11, 12 and 14, T. 26 N., R. 9 E., one mile

south of Greenville, or five miles north of Crescent Mills on the Indian Valley Railroad. The road is good with the exception of the last three-quarters of a mile up to the mountain, which is steep and has been cut by running water; but this could easily be repaired. Elevations on the property vary from 3600 to 4600 feet. Three patented claims and two unpatented claims have an area of 75 acres. Old workings on three veins, the Southern Eureka, Hibernia or Indian Valley and a cross-vein, have been described in former reports of this Division.

In December, 1927, a new ore-shoot was found in this mine on a vein thought to be a part of the Crescent vein. The shoot as developed is 300 ft. long, 3 ft. wide and the distance from the drift to the outcrop is 200 ft. Stopes of the following size have been made in this shoot: 20 ft. long, 10 ft. high, 3 ft. wide and 130 ft. long, 40 ft. high and 3 ft. wide. 300 tons of \$50-ore are said to be developed in the faces of these stopes at the present time. The strike is north and the dip vertical. Costs on the ore shipped were as follows: mining \$1.50, treatment \$7, hauling \$2.50 and transportation \$7. Country rock is diorite. Equipment consists of a compressor of 4-drill size, 2 jackhammers, track, 3 cars and a boarding house with 8 bedrooms.

Summit Group. Owner, A. N. Cameron, Seneca. Location, Secs. 2, 11 and 12, T. 25 N., R. 7 E. The property consists of 80 acres of patented quartz claims, Mineral Survey 5220, and the unpatented Orton placer claim. A vein with a slate hanging-wall and a limestone



Standart Mine, Plumas County.

footwall runs \$3 per ton. It is 40 to 130 ft. wide, strikes northwest and dips 75° northeast. The vein has been traced for a distance of 7500 ft. on the property. A tunnel one-half mile long could be driven from the Orton placer to give backs of 2000 ft. on the vein.

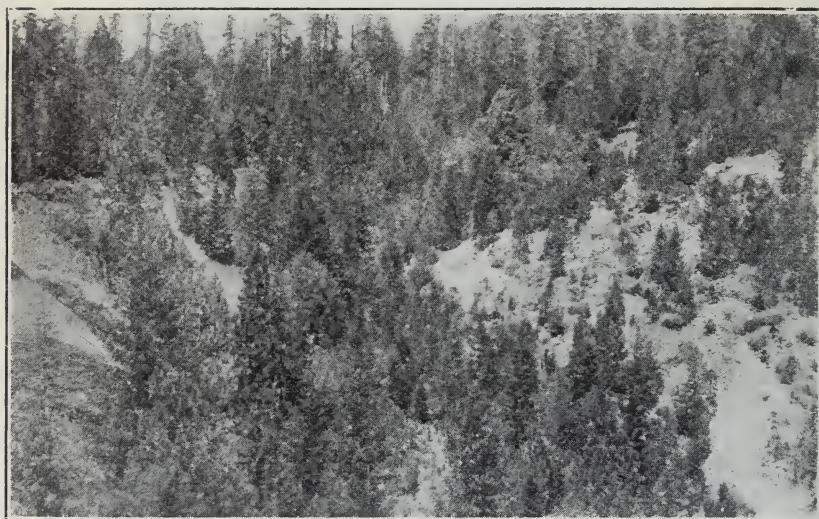
Wyatt Prospect. Owner, W. A. Wyatt, Susanville. Location, Sec. 35, T. 23 N., R. 7 E. This prospect consisting of three claims adjoins

the Hose mine, which see. A 20-ft. shaft has recently been sunk on a 3-ft. quartz vein showing sulphides of copper, and said to run well in gold. Country rock appears to be andesitic.

GOLD (Placer Mines)

Barker Hill Claim. Location, Sec. 8, T. 26 N., R. 8 E. Present owners are Hammond Brothers, Seneca. This is an old hydraulic mine that still contains unworked gravel, which could probably be worked if a way could be found to economically impound the tailings and comply with the anti-debris laws. The photograph gives an idea of how the forest has grown over some of these old hydraulic mines since they were last worked.

Belden Placer. Owner, Robert Belden of Belden. Location, T. 25 N., R. 7 E., on Gansner flat two miles northeast of Belden, a station on the



Old hydraulic workings at Barker Hill Mine.

Western Pacific. Gravel is taken from the present channel of the North Fork of Feather River to a depth of 10 ft. and washed. Water is pumped with a 6-hp. gasoline engine, but the quantity encountered in the workings has become too great to handle with this. No important production has been made recently, and there was nobody at the property at the time of visit.

Bellevue Mining Company. Owners, Sir James Bell, Glasgow, Scotland and Sir Henry Bell, London, England. R. H. Kingdon, La Porte, is in charge. Location, Secs. 23, 24, 25, 26, 27, 34, 35 and 36, T. 22 N., R. 9 E., 4½ miles northeast of La Porte. This mine has not been worked for many years. Two thousand acres cover a length of three miles on Neocene channel gravel. In the winter of 1927, flood waters broke a flume and washed a deposit of gravel several feet deep over the ground surrounding the buildings. Repair work on this flume was just being started at the time of visit to the La Porte district.

Buckhorn Gravel Mine. Owners, J. W. Fricke, c/o G. F. Weber Co., 601 Mission St., San Francisco, and F. F. Weber. Location, Secs. 7 and 18, T. 23 N., R. 11 E., two miles south of Spring Garden. Supplies are taken to the mine over six miles of steep mountain road, then one mile down the steep side of the canyon of the Middle Fork of Feather River by sled. However, from the eastern portal of the Spring Garden tunnel of the Western Pacific, the distance is only one mile. The deposit is an ancient channel 300 ft. above the present Middle Fork of Feather River. The gold is all in the top one foot of bed rock and the bottom one foot of gravel. Development consists of 15 tunnels of a total length of 1500 ft.; and three acres of the gravel have been worked out. \$60,000 is said to have been produced by former owners and \$40,000 by the present owners. The last work done was the driving of drifts 7 ft. wide on the gravel; and production from this is said to have been \$4.15 per day for each man working. During the past 10 years, only assessment work has been done. Recently \$2,000 has been spent on new cabins. The Golden Feather, owned by the same two men and F. E. Raymond of Spring Garden, adjoins.

Cameron Mine. Owner, A. N. Cameron, Seneca. Location, Sec. 16, T. 26 N., R. 8 E., at Seneca. The Western and Ridgeway have been added to the old Cameron group to make a total of 380 acres covering two miles of the west bank of the North Fork of Feather River. The channel is 235 ft. above the level of the present river, and is capped by 500 ft. of lava. Cameron has driven a crosscut to the channel, then followed gravel northeasterly 1000 to 1100 ft. and mined 35 to 120 ft. in width and 6 to 7 ft. in depth including 1 ft. of bedrock. He never reached the low places in the channel, and there is unworked gravel left in them, all of his work being to the southeast of the center-line of the channel. Since 1887, the mine has produced \$100,000. Above the gravel mined, there is 4 ft. of sand, and above the sand another layer of gravel that has been shown by tests to carry \$3 per cu. yd. in gold. Gilmer Brothers ran a crosscut from the 800-ft. point in the Cameron tunnel northerly through the slate bedrock for a distance of 2250 ft. and raised to the old surface every 150 ft. in the expectation of finding a faulted segment of the Dutch Hill channel; but no gravel was discovered. On the Cameron, Sunset and Western, a total of 5400 ft. of work has been done. The Western tunnel is in 500 ft. and 300 ft. of the channel has been worked. Chas. Dempster of New York has an option on this entire property. The Glazier adjoins to the northeast and the Sunnyside to the southwest, and the San Jose and Scott mines are between the Cameron and the present river.

Continental Mine. Owner, B. L. Jones, Quincy. Location, Secs. 19 and 20, T. 22 N., R. 11 E., nine miles west of Johnsville. The Continental Mining Company formerly owned this, but the area has now been reduced to 640 acres. It is at the north end of McRae Ridge, with the Sunnyside at the south end, and the channel is supposed to be continuous between the two properties under the lava capping. The Continental was a producer before the debris-laws were passed, and 20 acres remain that could be worked by the hydraulic method. Lessees are now working the gravel by ground-slicing.

Dominion Mine. Owner, A. McMillan, Seneca. Location, Sec. 4, T. 26 N., R. 8 E., on the east bank of the North Fork Feather River two

miles above Seneca. Nothing has been done on this property since MacBoyle's¹ report of 1918. The old work included a 40-ft. shaft below the level of the present river, showing that the ancient river was lower than the present river at this point. A. McMillan says that this shaft passes through 30 ft. of gravel, 5 ft. of sand, then 4 ft. of gravel and 1 ft. of bedrock. W. J. McMillan expects to develop 25 horsepower from water rights on the Upper and Lower Salmon creeks and to operate a Huelsdonk concentrator at this property.

Dutch Hill. Present owner not known; V. S. Barber of Seneca is said to have located a claim on this gravel. Location, Secs. 8 and 17, T. 26 N., R. 8 E., two miles west of Seneca. This is an old mine in gravels of Neocene age, which has been extensively worked both by the drift method and the hydraulic method. Nothing has been done with it for many years and the appearance is about the same as that of the Barker Hill, which is less than a mile away. A photograph of the Barker Hill has been given on a preceding page.

Ellis Group. Owner, H. O. Ellis, Caribou. Location, Sec. 35(?), T. 26 N., R. 7 E., on the North Fork of Feather River two miles below the Caribou power plant of the Great Western Power Company. The property can not be reached by road, but the spur track from the Western Pacific to the Caribou plant crosses it. Belden is nine miles southwest. Sixty acres are held on the Lenhardt channel, an old channel several hundred feet higher than the present river. A thin lava capping can be seen just above the portal of the tunnel. Gravel has been taken out in the lowest part of the channel to a depth of 5 to 6 feet. On a bench 20 ft. above, and off to the side, another pay streak has recently been found on bedrock, apparently in what was once a higher position of the old river. Ellis states that two higher channels exist on this property, which have not been worked.

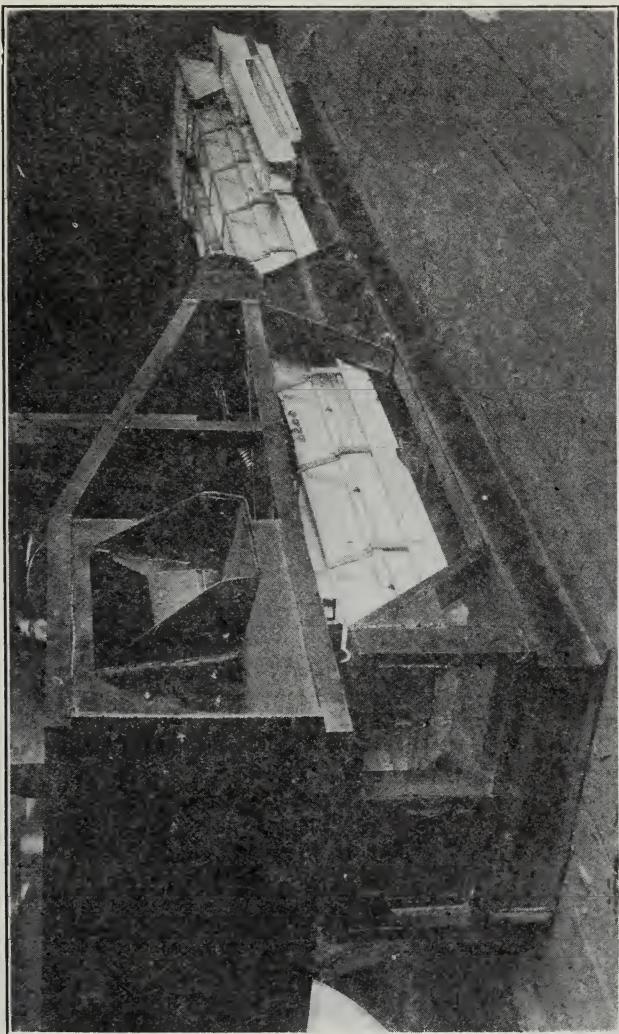
Mine water is collected in a tank 8 ft. square by 7 ft. deep, and is used to wash the gravel in a sluice below. Total production to date has been \$20,000. The Digger Ravine mine is a mile up the river on the same channel.

Glazier Mine. Owner, Dominion Mines and Development Company, W. J. McMillan, president, A. E. McKay, secretary, 503 Divisadero St., San Francisco. W. J. McMillan is in charge of the mine at Seneca. Location, Secs. 9 and 16, T 26 N., R. 8 E. From Crescent Mills on the Indian Valley Railroad, the mine is reached by a good mountain road of 21 miles. The property of 160 acres is located on the steep side of the canyon of the North Fork of Feather River. The Cameron mine adjoins to the south and the Pliocene to the north.

The deposit consists of auriferous gravels in an old channel of the river that is nearly 200 ft. higher than the present channel and is buried under five different flows of lava. A bed of gravel 5 ft. thick rests on a soft slate bedrock; above this is a layer of sand 4 ft. thick, and above the sand another layer of gravel 30 ft. thick. This upper layer of gravel was sampled at the adjoining Cameron mine and was found to be auriferous, but here only the lower gravel has been worked. A tunnel 1900 ft. long with portal 160 ft. above the present river runs under the deposit through the slate bedrock. Raises are driven from

¹ op. cit.

this tunnel to the gravel, which has been worked out for a width of 120 ft. and for a length along the channel of 200 feet. The gravel stands well and no great difficulty is encountered from boulders, which are piled back in the workings and left in the mine. Timber for the breasts is cut on the property, on which there is a plentiful supply, and costs 15¢ per post and 3¢ per cap. Four men, who receive \$5.77 per day each, are mining and washing 8 cu. yd. per day and piling



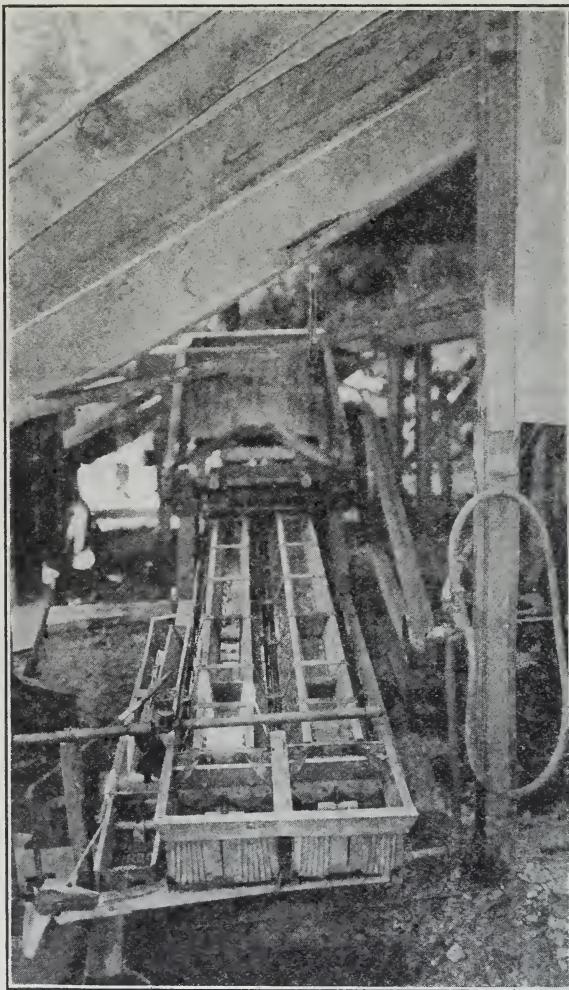
Huelsdonk concentrator at Glazier Mine. Shop photograph by courtesy W. J. McMillan.

back about an equal volume of boulders in the mine. The gravel washed is said to yield \$5 per cu. yd. in coarse gold, with an additional saving in fine gold mentioned below. Tailings are retained on a flat below the tunnel.

Mechanical equipment consists of a Rix compressor capable of supplying two machine drills, a blower for ventilation driven by a 2-hp.

engine, and a Huelsdonk concentrator driven by a 3-hp. engine. All of these use gasoline, the consumption of which is 5 gallons per day of 8 hours. Cars of 2200 lbs. capacity, running on light steel rails, are used in the main tunnel.

Of particular interest is the Huelsdonk concentrator, a machine recently developed for gravels of this type to improve the recovery of fine gold and sulphides. The old conventional type of sluice-box is



Huelsdonk concentrator at Glazier Mine.

used to catch the coarse gold, as in the past, and the concentrator is placed below it, the discharge from the sluice being the feed for the concentrator. The photographs show two views of the machine. The first is a shop photograph, and the hopper shows in the foreground. The second shows the machine installed at the mine. In the background may be seen the sluice-box discharging into the hopper, which,

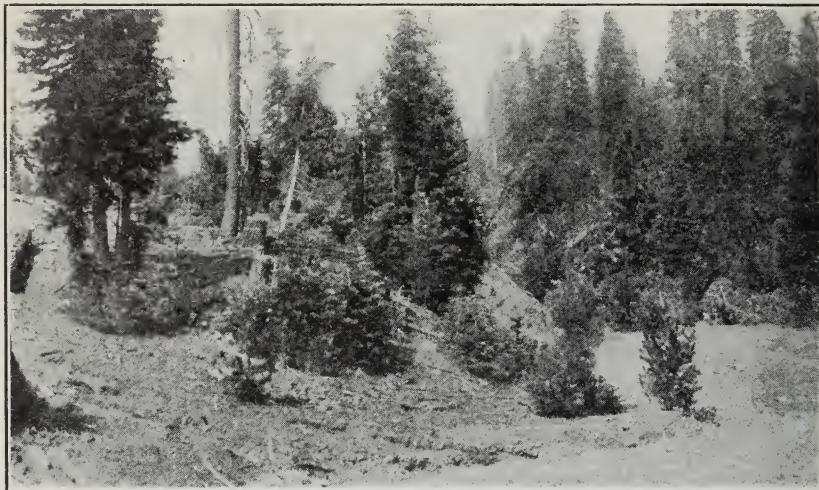
by means of a rod and eccentric, is kept in violent agitation. The gravel is thoroughly washed, and the coarse material is rejected through the spout to the left. The fine material drops through a double screen in the bottom of the hopper to the vibrating tables seen in the foreground. These are very similar to Wilfley tables, but are made entirely of galvanized corrugated steel. The tables concentrate the fine gold and the black sand or sulphides and make an excellent recovery of them. The rated capacity of the machine shown is 75 tons per day. At the Vallecito Western Mine, Vallecito, California, a larger machine is handling 12 tons per hour; and the operators are very much pleased with the separation made of both the gold and the sulphides. The ideas embraced in the machine are certainly sound and result in a great improvement over the crude methods commonly used to wash gravel; and the concentrator merits the consideration of anyone who is washing placer gravels.

Golden Horseshoe Mining Company. Owner, same company, Manuel Berdu, president, William Robertson, secretary, Mrs. A. J. C. Oddie, Quincy, treasurer. Location, Secs. 20, 21, 28 and 29, T. 23 N., R. 9 E., at Horseshoe Bend on the Middle Fork of Feather River, 12 miles south of Quincy. There is a steep mountain road from Quincy, the last four miles being mule-trail. The property was acquired by the present owners in 1910, and was closed down in 1915, except for assessment work. 160 acres are held, and one claim is said to be patented. The plan was to divert the river by means of a tunnel at the bend, and then mine the gravels from the channel, at the same time using the water from the tunnel to develop power, the available fall being 23 feet. A shaft 55 ft. deep, 8 by 8 ft., and 228 ft. of tunnel 8 by 10 ft. to divert the river were excavated at a total cost of \$31,000. The gravel is said to be of very high grade, but it has not yet been exposed in the workings.

Johnson and Rasmussen Mine. Owners, same, c/o J. W. Harriman, Taylorsville. Location, Sec. 33, T. 27 N., R. 11 E., just below the Lucky S mine. From Veramont station of the Indian Valley railroad, the property is reached by 16 miles of very steep and rough mountain road, crossing Kettle Rock at an elevation of 7850 feet. Gravel from a cut 300 to 400 ft. long, 20 ft. deep and 10 ft. wide has been washed with water from Peters creek while the snow was melting in the spring of this year. The clean-up of the sluice had just been started at time of visit. Equipment consists of a 10-hp. hoist and boom to remove boulders.

La Porte Mines Incorporated. (Feather Fork, Marguerite, McFarland.) Owners, Wallace Dinsmore Estate, c/o C. F. Aaron, Marysville, owns a one-half interest in 960 acres in Secs. 11, 14, 15, 22 and 23, T. 22 N., R. 9 E. This ground is patented and the other one-half interest is in the names of J. R. Garrett Co., Myra C. Hawley and Heiman Cheim. The La Porte Mines, Inc., has options on this and other claims, area 8000 acres, in T. 22 N., R. 8 E., R. 9 E and R. 10 E. covering 11 to 12 miles of channel, the course of which takes it just south of Pilot Peak. The home office of La Porte Mines, Inc., is 530 West 6th St., Los Angeles. W. L. Leland, La Porte, is president and is in charge of operations at the mine, Ila H. Sample is secretary and John N. Sobrero is mine superintendent. Quincy is 32 miles north of the mine by a steep mountain road open in summer only.

The elevation is 5400 ft. and there is plenty of pine and fir timber. Water is scarce in summer only; enough spring water is available for the boilers, but from November 1st, to July 15th, 2000 to 3000 miner's inches are available from the South Fork of Feather River, on which the present workings are located. This water will probably be utilized

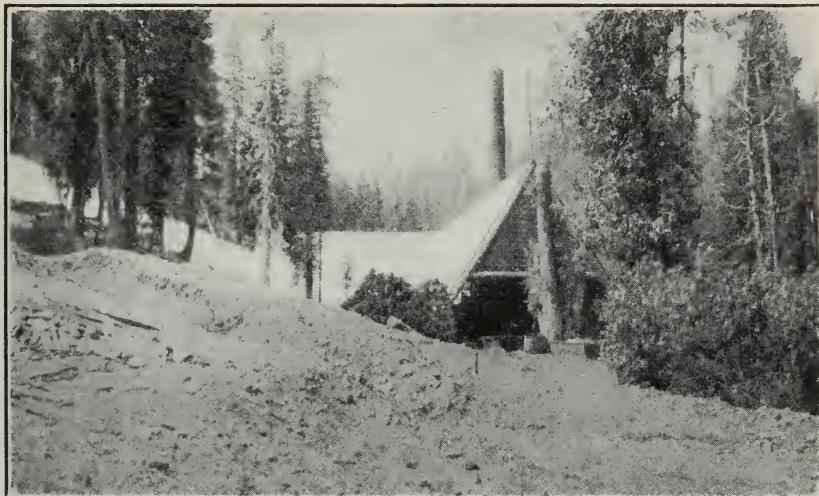


Two views of surface slide at La Porte Mines, Inc.

later to develop power as well as to wash the gravel. Mine water at the present time amounts to 72 gallons per minute.

The deposit of gravel was discovered in 1920 by drilling. It lies on a schist bedrock, the top of which is soft, then there is 47 ft. of quartz gravel, above that 39 ft. of clay, then 6 ft. of gravel. In places the channel is capped by 30 ft. or more of lava. The pay gravel is from

1 to 12 ft. thick and is not cemented, but contains many boulders. An incline 11 by 7 ft. has been put down 284 ft. to reach a vertical depth below the surface of 89 feet. At this depth a station was cut for a ten-car train, then a drift was driven 100 ft. southwest and turned to the south. At this turn the bedrock was found to be pitching 30°



Two views of shaft house of La Porte Mines, Inc.

to the south. The drift was continued level for 79 ft., then was run down grade. The total length from the turn is 150 feet. The present workings are 51 ft. below the McFarland workings, which are 1100 ft. away. The present operators have not yet removed any gravel, except in development-work, but McFarland is said to have worked out 2.07 acres to a depth of 6 ft. and recovered \$139,000.

Present workings were placed at a distance from the McFarland workings on account of a large surface slide, which is slipping on the clay stratum, and which has ruined the old workings including the Edgar shaft. Present workings are clear of this slide. W. L. Leland states that he has observed fallen trees which indicate that these slides have occurred at various times in the past.

Wood is being used for fuel to generate power in a 125-hp. boiler at a cost of \$35 per day. Other equipment includes two compressors of 600-cu. ft. per minute total capacity, Hendrie and Bolthof 10 x 14 in. double-cylinder hoist, Cornish pump, 7 in. x 6 ft., Cameron No. 5 sinker, Worthington duplex pump 4½ x 16 in., Fairbanks-Morse duplex pump 4 x 12 in., centrifugal pump, grinding wheels, drill presses, etc. A drill sharpener and machine tools are to be installed soon.

Gravel will be washed through a trommel and sluice-boxes. The trommel is necessary because of the presence of sticky clay. Eighty per cent of the tailings are to be elevated from the trommel and stacked; the finer tailings will be impounded behind a dam. At the time of visit, 42 men were employed at \$5.25 per day less \$1.25 for board and bunk.

Maynard Placer. Owner, George Wess of Rich. Location, Sec. 26, T. 25 N., R. 7 E., on Mill Creek, 1½ miles southeast of Rich. The Western Pacific Railroad affords the only easy access to the property. A road is now being built from the railroad to the mine, and is practically complete. Wess has a water right to 1000 miner's inches from Mill Creek, and takes the water through 1000 ft. of ditch to work the gravel of the creek by ground-sluicing. Many boulders are encountered, and are removed by means of a guy-line derrick and hand-winch. Some of them are too large to lift and must first be broken. Wess plans to install a power derrick with a capacity of five tons this season. Other equipment consists of a shop and a house. A drift 75 ft. long has been driven in gravel to the west of the present creek, and is tightly timbered with light sets. Wm. McAulife, Tonopah, Nevada, owns an adjoining claim.

Pacific Foundation Corporation. For officials of this company, see the same name under Gold (lode mines). The company has two placer claims covering a quarter of a mile along Mill Creek in Sec. 22(?), T. 25 N., R. 7 E., one mile east of Rich. The Western Pacific Railroad affords the only easy access to the property. The claims are at the mouth of Mill Creek, where it flows into the East Branch of the North Fork Feather River. C. S. Frame is the former owner; and G. H. Anderson is building a house at the property. These men stated that a power derrick of 5- to 6-ton capacity would be installed during the present season and the gravels of the present stream worked; also that drifts would be run on a gravel deposit left by the stream in a former course.

Pliocene Mine. Owner, J. S. Bransford, Pasadena. Location, Secs. 4 and 9, T. 26 N., R. 8 E., one mile north of Seneca. This is an old property on the same ancient channel of the North Fork of Feather River on which the Dominion and Glazier mines are located; and it was formerly developed by a 1200-ft. tunnel, but has been idle for years. The gravel is exposed on the surface where the present river cuts the old channel. W. J. McMillan of Seneca has a lease and option on the

property and expects to operate during the coming year, working the gravel into a Huelsdonk concentrator.

Sunnyside Mine. Owner, B. L. Jones, Quiney. Location, Secs. 5, 6, 7 and 8, T. 21 N., R. 11 E., eight miles southwest of Johnsville. A total of 200 acres are held in Plumas and Sierra counties. 26,608 cu. yd. of gravel, worked before the debris-laws were passed, produced \$100,000. The largest nugget found weighed 15 pounds and was sold for \$3,276. An 831-ft. tunnel was driven, and a shaft was sunk from it to bedrock. The shaft was all in gravel, and the bottom is said to have been rich in coarse gold. Haley¹ has cited this property as an example of a favorable place to conduct drift-mining. At the adjoining Gibralter mine in Sierra County, 12 to 18 men are driving a tunnel to prospect a similar deposit.

Sunnyside Mine. Owner, Plumas Gold Mining Company, Boston, Massachusetts. V. S. Barber of Seneca is in charge. Location, Secs. 17, 18, 19 and 20, T. 26 N., R. 8 E., 3 miles southwest of Seneca. Patented ground of an area of 160 acres is held. MacBoyle² has given a description of the old workings. Since his report, the channel has been worked for a length of 150 feet. For 80 ft., it was worked out for a width of 100 ft., the balance being prospect drifts. The tunnel is higher than the channel; and the channel is sloping downward in a direction a little east of north away from the point where the tunnel cuts it. Inclines below the tunnel level are used to remove the gravel, which is loaded on cars and pulled up the incline by means of a hand-windlass. Depths below the tunnel level reached by the three inclines are 14, 18 and 25 ft.

Since his report some rich benches were worked on the front rim and prospect drifts sunk on the depressed forward part of the channel to a depth of 26 feet below the tunnel grade. The small amount of water seeping into sublevels is removed by siphon. Two men were working on a crosscut connection at the time of visit. The recent working produced from \$20 to \$26 per square yard of bedrock.

The tunnel in use at present was driven by the Seneca Development Company in 1910-11. It has a grade of $\frac{3}{4}$ of 1% and at 740 feet is 40 feet under the channel; turning to the right. It is about the level of the channel at 960 feet, and the face, in 1340 feet, is 25 feet higher than the bed of the channel, due to overthrust faulting reversing the grade of the bed since the 800-foot lava cap covered it.

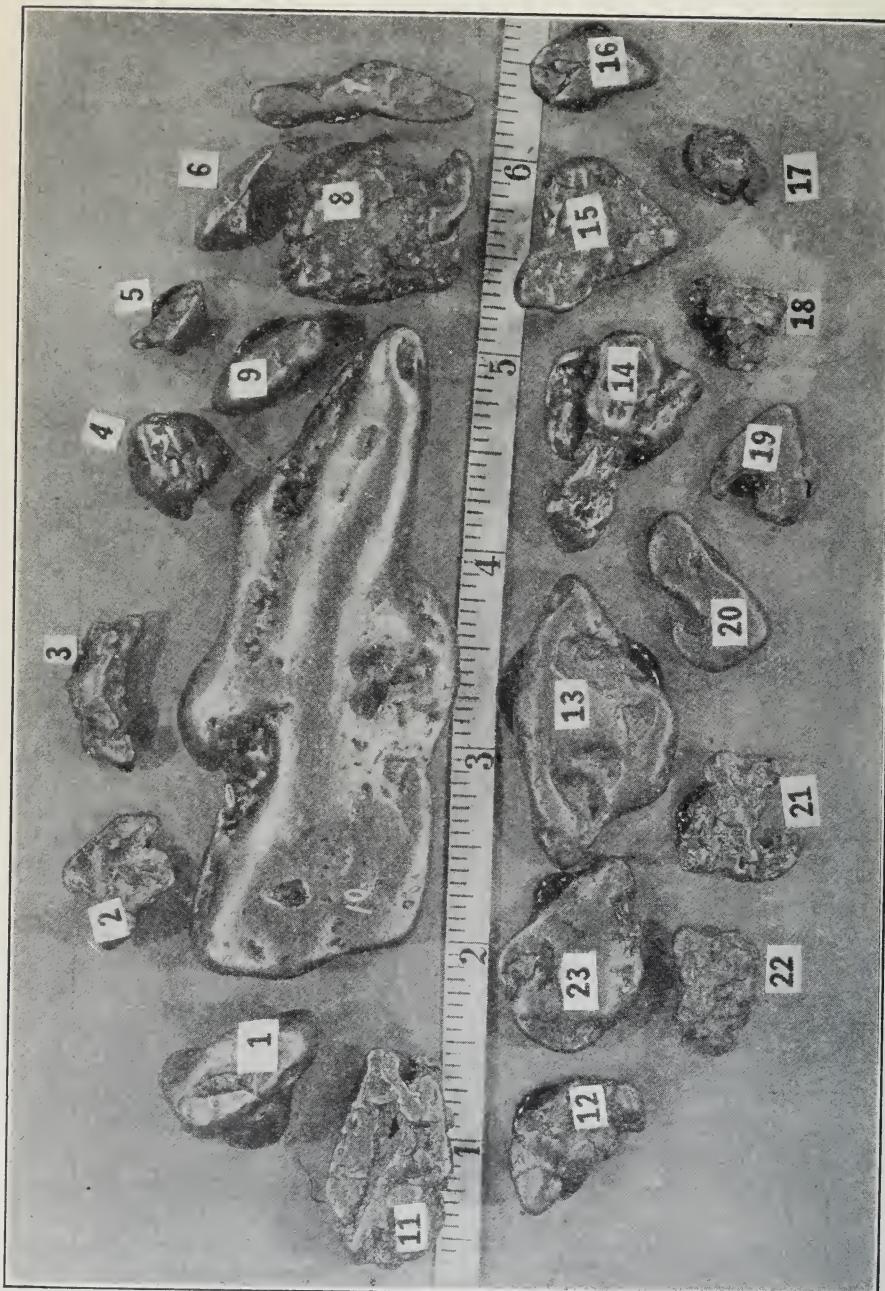
About 2000 feet of unworked channel are said to remain within the lines of the Sunnyside. No power or compressed air has been used in this mine, so only the richest gravels have been extracted. Possibly much of the blocked-out gravels of the old works would pay a profit if worked at lower cost with machinery.

A water right is owned on Clear Creek with a minimum quantity available of 40 miner's inches at a head of 700 feet.

Sunrise Placer Mine. Owners, John J. Mullen and family (four in all) of La Porte. Locations, Secs. 18 and 19, T. 22 N., R. 9 E., seven miles northwest of La Porte. 560 acres are held covering a length along the channel of 4000 to 5000 feet. An 1800-ft. tunnel starts at a point well below the channel, but the slope of the channel carries it down to

¹ Haley, C. S., Gold Placers of California, State Mining Bureau, Bull. 92, p. 114, 1923.

² op. cit.



Actual size photograph of nuggets from Sunnyside Mine. Photo by courtesy of V. S. Barber.

1 gram = \$0.57854. (Weight given in grams.)

No.	Grams	Value	No.	Grams	Value
1	28.8	\$16 66	13	35.5	\$20 64
2	7.6	-----	14	25.1	14 52
3	6.1	-----	15	18.1	10 47
4	10.5	-----	16	6.9	-----
5	2.5	-----	6	07	-----
6	5.1	-----	7	17	5.4
7	6.6	-----	8	18	3.3
8	31.3 (with quartz)	-----	9	19	5.3
9	8.6	-----	10	20	8.6
10	177.5	-----	11	21	6.8
11	20.5	102 70	12	22	12.1
12	8.9	11 86	13	23	15.6
					9 01

the tunnel level, and the last work in the tunnel was in gravel for a considerable distance. At 1100 ft. from the portal there is a 35-ft. raise to gravel; at 1300 ft. is a 20-ft. raise to gravel; at 1650 ft. is a 28-ft. shaft all in gravel; and at 1750 ft. there is a 40-ft. shaft which encountered such a large flow of water that work was discontinued. Gravel removed from an area of 31,000 square feet produced \$4,350. The bedrock is slate. There is a vertical fault on the property, which probably displaces the channel 100 ft. vertically.

LIMESTONE

Pyramidal Lime Deposit. (Feather River Pyramid Lime and Cement Co.) Owner, H. C. Flournoy, Quincy. Location, Secs. 6, 7 and 8, T. 25 N., R. 8 E., on the Western Pacific Railroad at Virgilia. The property has an area of 960 acres, 480 acres of which are patented. It lies on the high ridges and steep slopes between the North Fork of Feather River and the East Branch.

The following comments on the geology and the analyses are extracts from a report on the deposit by Edw. H. Scott. The formation is a sedimentary marine deposit of limestones, calcareous shales and some strata of possibly truer slates. It is part of the Cedar formation of Diller and belongs to the Jura-Trias period. To the east of the lime deposit at Rush Creek lies a body of conglomerate 100 ft. wide. To the east of the conglomerate lies a body of black slate 50 to 60 ft. wide; while to the west of the lime belt are shales. The general strike of the lime belt is N. 30° to 35° W. with a dip to the east of 70° to 80° . At Cherry Peak the limestone is 800 ft. wide.

An analysis follows of a composite sample of the lime, including layers of calcareous shales that are found interbedded with the limestone in parts of the deposit, with an analysis of Belgian 'Natural Portland' cement-rock for comparison.

	<i>Belgian Composite "Natural Portland"</i>
Iron Oxide, Fe_2O_3 -----	1.3%
Alumina, Al_2O_3 -----	6.4
Silica, SiO_2 -----	14.0
Magnesia, MgO -----	4.7
Lime, CaO -----	34.5
Carbon dioxide, CO_2 -----	32.3 }
Water -----	6.4 }

Another analysis follows of a composite of 11 samples of this limestone, with some average high-lime rock of the Standard Portland Cement Co. for comparison. (For chemical symbols, see above.)

	<i>Average high-lime rock. Standard Portland Cement Co., Napa Junction</i>
	<i>Composite</i>
Water -----	3.4%
Iron oxide -----	0.4
Alumina -----	1.6
Magnesia -----	0.3
Silica -----	6.0
Lime -----	49.1
Carbon dioxide -----	39.1

Below is an analysis of slate which is separated from the limestone by 100 ft. of conglomerate, with an analysis of a slate used in the manufacture of Portland cement at Rockmart, Georgia.

	<i>Slate, dried</i>	<i>Rockmart slate</i>
Iron oxide -----	9.1%	4.45%
Alumina -----	20.4	23.65
Silica -----	65.2	57.4
Lime -----	2.7	3.23
Carbon dioxide -----	2.1 }	
Water -----	-- }	6.80

This slate mixed with the limestone in the proportion of about six parts of limestone (composite) to one of slate would make good material for Portland cement. It is possible that the shales to the west will also afford material suitable for adding to the limestone to make a Portland cement mixture.

At the place where the following sample was taken, the limestone was of fine appearance, and for a width of 150 ft. from the hanging-wall, it was entirely without shale strata; and strong croppings showed a total width of 350 ft. with no shale apparent.

	<i>Limestone, dried</i>
Iron oxide and alumina -----	1.6%
Magnesia -----	0.3
Silica -----	2.9
Lime -----	53.3
Carbon dioxide -----	41.9

The deposit has been developed by means of a tunnel 275 ft. long; and a small amount of the limestone has been quarried. This has been burned in a pot-kiln 20 ft. high and 10 ft. in diameter at the base, with a capacity of 350 barrels of burned lime. Lime burned in 1919 and 1920 amounted to about 2500 barrels and in 1927 to 350 barrels. This lime was sold for building purposes.

This deposit has a length of several miles with very good widths; and the analyses given above indicate that it is commercially important, especially when the convenient railroad transportation is considered.

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- Gold Placers of California by Charles Scott Haley: California State Mining Bureau, Bull. No. 92.
- Geology of the Taylorsville Region, California, by J. S. Diller: U. S. Geol. Survey Bull. 353.
- Report of the State Mineralogist of California: VIII, 1888, p. 476.

LIST OF MINES OF PLUMAS COUNTY

Name	Lode, placer or copper	Address	Location		
			Sec.	T.	R.
Hambra Mine Antlered Crest Co.	L P	M. McIntosh, Quincy. c/o R. E. Sandborn, c/o Calif. Packing Corp., 101 California St., San Francisco 11, 12, 14, 15 6, 7 31	15 10, 15 1, 12 13, 14, 23 8	22 N. 26 N. 24 N. 25 N. 26 N.	8 E. 9 E. 9 E. 9 E. 9 E.
Aradian Australia Placer Mining Co.	L P	P. P., D. J. & J. A. McIntyre, Greenville. c/o D. J. Hyland, 337 Commercial Ave., South San Francisco. c/o A. B. Hill, Jr., 201 Sansome St., San Francisco.	15 10, 15 1, 12 13, 14, 23 8	21 N. 22 N. 21 N. 22 N. 21 N.	8 E. 9 E. 8 E. 11 E. 8 E.
Austrian Syndicate	L & C	Savercoll Bros., Butte Valley.	15 10, 15 1, 12 13, 14, 23 8	25 N. 25 N. 26 N. 28 N.	11 E. 11 E. 11 E. 11 E.
Barker Hill	P	Harry Barnes, Englemin.	15 14, 15	26 N.	11 E.
Beardsley Group	C	c/o A. L. Beardsley, 827 Roosevelt Building, Los Angeles.	15 2, 3, 10, 11 23, 24, 25 35, 36	25 N. 24 N.	7 E. 9 E.
Beardsey	C	Robert Belden, Belden.	15 24, 25, 35	26 N.	11 E.
Belden	P	David J. Heisey, D. D. S., 805 Federal Bank Building, Dubuque, Iowa. c/o R. H. Kingdon, La Porte.	15 23, 24, 25 36, 27, 34 35, 36	25 N. 24 N.	7 E. 9 E.
Bell, Iowa, Leavitt Ext.	P	Genesee Cons. Mines Company, 250 Lake St., Reno, Nevada.	15 24, 25, 35	26 N.	11 E.
Bellvue Mining Company	C	V. S. Webb, 640 State Building, San Francisco. W. C. Moran, 63d & Adeline, Berkeley. W. H. Duncan, Meadow Valley. H. H. Evans, Clio. J. W. Fricke, 601 Mission St., San Francisco.	15 27, 34 3 3 1 7, 18	25 N. 22 N. 22 N. 21 N. 23 N. 28 N.	9 E. 10 E. 7 E. 12 E. 11 E. 11 E.
Big Cliff	P	c/o J. T. Buel, La Porte.	15, 16	22 N.	10 E.
Black Hawk	P	P. M. Curtin, 185 S. 16th St., San Jose, Lessee, L. L. Clough, Quincy.	34	25 N.	9 E.
Bonnie	P	G. W. Gaberel, Blairston.	35	23 N.	8 E.
Broten Back	L	F. I. Butterfield & A. H. Paddock, Spring Garden.	19	24 N.	11 E.
Brown Bear	P	G. M. Sparks, 320 Meyers St., Oroville	25, 36	23 N.	6 E.
Buckhorn Gravel	P	H. S. Hersman, Gilroy.	33	26 N.	10 E.
Bull of the Woods	C	A. N. Cameron, Seneca.	16	26 N.	8 E.
Bunker Hill	P	c/o Ed. Harkness, Chico.	23, 26	25 N.	5 E.
Bushman	P	Wm. Black & J. B. Sommers, 2726 Maxwell Ave., Oakland.	10, 11	23 N.	10 E.
Buttie Bar	L	Mrs. C. Lazarvitch, Seneca.	9	26 N.	8 E.
Burnettfield & Paddock	L	See Castle Rock.	9	26 N.	8 E.
Caldwell	L	P. B. L. Jones, Quincy.	19, 20	22 N.	11 E.
California	L				
Dameron	P				
Cash Entry Mining Co.	P				
Castle Rock	P				
Chico Star	L				
Comet, Mineral Survey	L				
Continental	P				

C	Cooper-----	Goodhue Bros., Genesee-----	25 N.	11 E.
	See Reward.	Tom Can et al., Susanville-----	27 N.	10 E.
	Cosmopolitan-----	c/o Mrs. A. J. Coddie, Quincy-----	23 N.	9 E.
	Cottonwood Group-----	c/o A. H. Reddington, Mills Bldg., San Francisco-----	26 N.	9 E.
	Cresent Hill Con. Gold Mincs of Calif.	Geo. D. Blood, 2016 Hunter Duln Bldg., San Francisco-----	26 N.	9 E.
	Crown Point & Summit-----	W. J. Curtner, 1853 16th St., San Jose-----	19	11 E.
	Crown Point Mine-----	Mark L. Miller, Caribou-----	2	11 E.
	Curtner Placer-----	I. M. & Fannie J. Daniel, Oroville-----	34	7 E.
	Dabney-----	L. A. Davison, Box 483, Napa-----	7, 8	7 E.
	Daniel-----	W. C. Robinson, Meadow Valley-----	29	22 N.
	Davidson-----	See Shaffer Gold Mining Company.	24 N.	8 E.
	Deel Monte-----	L. I. Clough, Quincy-----	33	24 N.
	Diaudem-----	See Ellis Group.	31	23 N.
	Digger Ravine-----	C. O. Dodge & T. O. McAtee, Oroville-----	4	26 N.
	Dodge & McAtee-----	A. McMillan, Seneca-----	9, 10, 15, 16	26 N.
	Dominion-----	See Glazier.	17, 18	9 E.
	Dominion Mines & Dev. Co.-----	Lindblom Investment Co., Hotel Claremont, Berkeley-----	8, 17	8 E.
	Droege-----	Basst of W. E. Duncan, Oroville-----	30	26 N.
	Dunean-----	V. S. Barber, Seneca-----	24 N.	8 E.
	Dutch Hill-----	John Dutre, Spring Garden-----	10	11 E.
	Dutre-----	See Rich Gulch Con. Gold Mines.	35	24 N.
	Elizabethtown Flat-----	S. M. Leavitt, Quincy-----	3, 4, 5, 8, 9,	26 N.
	Ellis Group-----	H. O. Ellis, Caribou-----	10, 15, 16, 17,	28 N.
	Engels Copper Mining Co.-----	393 Mills Bldg., San Francisco-----	19, 20	11 E.
	Feather Fork-----	See La Porte Miners, Inc.		
	Feather River Pyramid Lime & Cement Co.-----	See Pyramidal Lime Deposit.		
	Fenton Group-----	See Daniel.	23, 25, 26	25 N.
	Five Bears-----	H. F. Meidinger, 8109 Manafort Ave., Chicago, Illinois-----	26, 27	11 E.
	Genesee Con. Mines Co.-----	See Big Cliff, Hinckman, Mountain Lion.	9, 16	25 N.
	Genesee Placer-----	Lena D. Haun, Quincy-----	12	11 E.
	Glazier Mine-----	Dominion Mines & Dev. Co., 503 Devisadero St., San Francisco-----	20, 21, 28, 29	8 E.
	Golden Horseshoe Mining Co.-----	See Buckhorn Gravel.	19, 20, 29, 30	23 N.
	Gold Leaf Mine-----	Mrs. A. J. C. Oldie, Treas., Quincy	24 N.	9 E.
	Gold Mountain Hydraulic and Dredging Co.-----	W. D. Stone et al., Long Beach-----		11 E.
	Gold Stripes Mine-----	G. W. Fagg, 201 Grant Bldg., Los Angeles-----	14	7 E.
		Cassie M. Hamilton, Oroville-----	36	27 N.
			1	8 E.
				26 N.

LIST OF MINES OF PLUMAS COUNTY—Continued.

Name	Lode, placer or copper	Address	Location		
			Sec.	T.	R.
Green Ledge & Mother Lode	L	Mrs. Florence Worley, Hotel Sutter, Yuba City	14, 15, 23	25 N.	11 E.
Green Mountain Mine	L	Harold Boericke, 1310 Packard Bldg., Philadelphia, Pennsylvania	23, 24	26 N.	9 E.
Greenwood	C	Tom Carr, Susanville		28 N.	11 E.
Gruss	L	Dr. F. Gruss et al., 12 Geary St., San Francisco	14	25 N.	11 E.
Hall & Lund	P	A. A. Hall & C. S. Lund, Quincy	18	24 N.	9 E.
Halstead	L	A. Halstead et al., Meadow Valley	12	25 N.	7 E.
Harriman Group	L	J. W. Harriman, 919 Gaviota Ave., Long Beach	7	25 N.	8 E.
Hazard	L	Mrs. Eva Baker, 4 Arcade Bldg., Reno, Nevada	28	27 N.	11 E.
Hinchman	L & C	Genesee Con. Mines Co., 250 Lake St., Reno, Nevada	15	26 N.	8 E.
Hobson	L	W. F. Roedde, Crescent Mills	6	25 N.	11 E.
Hose	L	W. H. Duncan, Meadow Valley	29, 30	26 N.	9 E.
Hudson	L	See Jackson	26	23 N.	7 E.
Husselman & Shaw	L	Probably open ground			
Indian Placer	P	State of California, Taxes delinquent	1, 12, 13	27 N.	10 E.
Iron Dike	C	F. D. Beardsley, c/o A. L. Beardsley, 827 Roosevelt Bldg., Los Angeles	6, 17, 18	27 N.	11 E.
Jackson	L	J. W. Ryan & Samuel Altshuler, 333 Kearny St., San Francisco	35, 36	26 N.	8 E.
Jamie	L	Estate Geo. C. Perkins, 639 Kenway Road, Oakland	2	25 N.	10 E.
Jamison	L	See Plumas Empire Annex Mining Co.	13, 14, 23, 24	26 N.	9 E.
Johnson & Rasmussen	P	c/o J. W. Harriman, Taylorsville	36	23 N.	6 E.
Joseph	L	See Curtner			
Kennebeck	L	Cate Bros., Quincy			
King Solomon	L	See Plumas Gold Mining Co.	25	25 N.	10 E.
Lanfear	P	J. E. Lanfear	18	24 N.	11 E.
La Parte Mines, Inc.	P	530 W. 6th St., Los Angeles	11, 14, 15	22 N.	9 E.
Laura	L	Geo. D. Blood, 2016 Hunter Dulin Bldg., San Francisco	22, 23	22 N.	13 E.
Leece Syndicate, Timber	L	441 Virginia St., Reno, Nevada	7	26 N.	9 E.
Lena	L	See U. S. Smelting, Refining and Mining Exp. Co.	14	26 N.	
Littlefield Group	C	F. N. Littlefield, G. W. Young, J. H. Weber, Greenville	33	27 N.	8 E.
Lott	P	Estate of C. F. Lott, c/o Mrs. Cornelia Saph, 1407 Montgomery St., Oroville	20	25 N.	6 E.
Lucky Boy	C	Harriman-Blakeman Corp., 27 Williams St., New York City	28	27 N.	10 E.
Lucky S.	L & P	H. G. Erickson, Del Monte Apts., Redding, and T. McGinnis	21, 22	25 N.	11 E.
Lucky Strike	P				

P	Manhattan Gold Mining Co.	C. E. Hegard, Pres., 430 San Mateo Dr., San Mateo	28, 33	24 N.	9 E.
P	Maples Flat Con. Placer	Parry R. Cole, 365 N. Wilton Place, Los Angeles	31	25 N.	8 E.
P	Marguerite.	See La Porte Mines, Inc.			
L	Martin & Nicoll Prospect.	Geo. T. Martin & A. J. Nicoll, Box 664, Susanville	35	27 N.	8 E.
P	Geo. Wess, Rich		26	25 N.	7 E.
P	Maynard placer	See La Porte Mines, Inc.			
P	McFarlane.	See Trask & Coffier.			
C	Moonlight.	See Green Ledge.			
L	Mother Lode.	Genesee Con. Min. Co., 250 Lake St., Reno, Nevada	15, 22	25 N.	
C	Mountain Lion	Mrs. H. G. Murdock, Hotel Golden, Reno, Nevada	25	24 N.	
C	Murdock.	G. & L. Mining Co., 250 Lake St., Reno, Nevada	30	24 N.	
C	Native Son.	Cape Bros. & Sam Leavitt, Quincy	24	25 N.	
P	Newton Con. Placer Mines	See Plumas Gold Mining Co.	3	24 N.	11 E.
L	New York Mine.	H. G. Erickson Del Monte Apts., Redding, and T. McGinnis	13, 14	24 N.	9 E.
P	Niagara.	Tim Hutchinson, Seneca	19	26 N.	11 E.
P	Nona Lee Placer	Vincent E. Bayless, c/o David J. Heisey, 805 Federal Bank Bldg., Dubuque, Iowa	34	25 N.	8 E.
L	O. K. & T. C. Claims.	See Summit Group.	22	25 N.	7 E.
C	Orton Placer.	See Text for Directors	19	24 N.	11 E.
P	Pacific Foundation Corp.	See Text for Directors	12, 13	26 N.	10 E.
L	Pacific Foundation Corp.	Arthur Peter	14, 23	25 N.	11 E.
C	Peter.	Goodhue Bros., Genesee			
P	Pilot Copper Mine.	Estate of W. P. Boyden, c/o Wolf Cr. Timber Co., 903 Alexander Bldg., San Francisco	28	26 N.	9 E.
P	Pioneer.	J. S. Bransford, Pasadena; Lessee, W. J. McMillan, Seneca	4, 9	26 N.	8 E.
L	Pliocene.	No. 1 Federal St., Boston, Mass., or c/o C. D. Stark, Johnsboro	2, 11, 12	22 N.	11 E.
L	Plumas Eureka Corp.	13, 14, 22,			
L	Plumas Annex Mining Co.	23, 26			
L	Plumas Gold Mining Co.	25, 26, 27			
L	Plumas Jumbo.	10, 15			
L	Premium.	26 N.			
L	Prospect Claim.	9			
Lime	Pyramidal Lime Deposit.	32, 33	26 N.	10 E.	
P	Red Slide.	13	26 N.	9 E.	
P	Reising.	6, 7, 8	25 N.	8 E.	
C	Reward.	4	22 N.	10 E.	
C	Rich Gulch Con. Gold Mines.	Margaret N. Hart, 1823 Turk St., San Francisco	9	25 N.	8 E.
C	Rio Vista Mining Co.	H. C. Flournoy, et al. Quincy	3	25 N.	11 E.
L	Riverdale.	I. L. Rosenthal, Room 500, 177 Post St., San Francisco	12	25 N.	7 E.
P	Ruby Copper Mine.	J. M. Little, 3621 Broadway, Oakland	4, 10	23 N.	10 E.
P	Savercool.	Wm. Black & J. B. Sommers, 2726 Maxwell Ave., Oakland	11, 15, 16		
P	San Jose.	Milton A. Purdy, Quincy	10	24 N.	9 E.
C	Scallop.	O. B. Camp, Engelineine	13	27 N.	10 E.
L	Sequoia.	J. R. Murray, c/o W. T. Treleaven, Engelineine	4, 5	26 N.	8 E.
P	Shasta.	H. F. Kelly, Caribou	17	26 N.	8 E.

LIST OF MINES OF PLUMAS COUNTY—Continued.

Name	Lode, placer or copper	Address	Location		
			Sec.	T.	R.
Scad Point Claim	P	W. C. Robinson, Meadow Valley	28	24 N.	8 E.
Scott, Fred, Placer	P	W. W. Sharp, Susanville	16, 17	26 N.	8 E.
Seneca Con. Gold Mining Co.	L	See Shaffer Gold Mining Co.	9, 10, 11	26 N.	8 E.
Shaffer Gold Mining Co.	L	Chas. B. Shaffer, Chicago, Illinois	14, 15, 16	25 N.	7 E.
Shenandoah	L	J. W. Schulze, Rich & Geo. H. Pearce, 1263 N. Pilgrim St., Stockton	28	25 N.	7 E.
Standart Group, (Southern Eureka), Summit	L	F. J. Standart, Greenville	11, 12, 14	26 N.	9 E.
Sunnyside	P	A. N. Cameron, Seneca	2, 11, 12	25 N.	7 E.
Sunnyside	P	Plumas Gold Mining Co., Boston, Mass., or c/o V. S. Barber, Seneca	17, 18, 19, 20	26 N.	8 E.
Sunnyvale	P	B. L. Jones, Quincy	5, 6, 7, 8	21 N.	11 E.
Sunrise Placer	P	John J. Mullen et al., La Porte	18, 19	22 N.	9 E.
Swiss	P	W. B. Perry, Greenville	18	26 N.	8 E.
Taylor Diggings	P	J. M. Longenecker, 337 S. Hobart Bldg., Los Angeles	29	26 N.	11 E.
T. C. Claim		See O. K.			
Telge	C	See Beardsley.			
Trask & Coffey	C	C. L. Eaton, c/o Indian Valley Railroad	13	27 N.	10 E.
U. S. Smelting, Refining & Mining Exp. Co.	C	Newhouse Bldg., Salt Lake City, Utah	7	24 N.	12 E.
Valentine Claim	L	Geo. H. Stephan et al., Quincy	12	24 N.	11 E.
Walker Bros. Con. Copper Co.	C	c/o Walker Bros., Dry Goods Co., Salt Lake City, Utah	30	22 N.	13 E.
Walker Mining Co.	C	Kearns Bldg., Salt Lake City, Utah	1, 11, 12	24 N.	11 E.
Wardlow		See Plumas Gold Mining Co., Greenville.	5, 6, 7, 8	24 N.	12 E.
Western		See Cameron.	29, 30, 31, 32	25 N.	12 E.
Western Star Gold Mining Co.		1224 Broadway, Oakland	9	25 N.	9 E.
White Lily		See Shaffer Gold Mining Co.			
Whitney		See Jackson.			
Wolters		W. P. Frick, 212 Easton Blvd., Oakland	24	21 N.	7 E.
Wyatt		W. A. Wyatt, Susanville	35	23 N.	

SAN FRANCISCO FIELD DIVISION

C. McK. LAIZURE, Mining Engineer

MADERA COUNTY**Introduction.**

Madera County has existed as a separate political entity only since 1893. Prior to 1855 it was included in Mariposa County. In 1855 a portion passed under the jurisdiction of Merced County when it was organized; but in 1856 when Fresno County was created it was all included in the latter county and so remained until 1893 when that portion north and west of San Joaquin river was separately organized as Madera County. The name 'Madera,' from the Spanish, meaning lumber, was given to the new county and to the county seat.

Geography.

The exact geographical center of the state probably falls within Madera County, which extends from San Joaquin river on the west, northeasterly for about 100 miles to the summit of the Sierra Nevada. This summit separates it from Mono County. Fresno County surrounds it on the south and west, San Joaquin river forming the dividing line. Merced and Mariposa counties bound it on the northwest side. The county is relatively narrow; its width being only about one-fourth of its length. The western third lies in San Joaquin Valley, the eastern two-thirds covering the foothills and high Sierra. Along the eastern boundary are a number of peaks from 12,000 to 13,000 feet in altitude, and this portion of the county is extremely picturesque. It contains the Devil's Post Pile, a 'National Monument' consisting of hexagonal basaltic columns, numerous small glacial lakes and mountain meadows.

The area of the county is 2112 square miles, 1,351,680 acres, and its population 12,203 (1920 census). Approximately 500,000 acres is farm land, of which 150,000 is irrigated. The balance is pasture, wood, timber and mountain land. Grapes, peaches, figs, cotton, hay and grain are the leading crops. Sheep and beef cattle constitute the chief livestock industry. Some of the finest sugar pine forests in the state are in this county, and lumbering is one of the most important activities. Its mineral output is valued at \$500,000 to \$1,000,000, annually.

Both the Southern Pacific and the Santa Fe main lines cross the valley end of the county, and the former has a branch line connecting Berenda with Raymond and Knowles. Minarets and Western Railroad runs from Friant, Fresno County, where it connects with the Southern Pacific, northerly through Madera County to Wishon on Bass Lake. The Madera Sugar Pine Lumber Company's railroad (not a common carrier) extends from Wishon to Sugar Pine, and their logging road on to Signal Peak, Mariposa County.

The state highway (valley route) also crosses the county, and a main lateral leads from Madera to Yosemite Valley, via Coarsegold and Wawona. Other roads via Raymond, O'Neals and North Fork connect with the Wawona road. Most of the county roads are in only fair condition, but they are being continually improved by county, state and U. S. Forest Service.

A noteworthy development is the building of a new road from Bass Lake, passable by auto to Beasore Meadow and by team to Jackass

Meadow and Clover Ranger Station, thus opening up an area formerly accessible only by trail. Presumably, this road will in the near future extend through and connect with the Minaret or Mammoth Pass roads from the east.

Hydro-electric plants of San Joaquin Light and Power Company within the county provide abundant electric power.

Geology.

The areal geology of Madera County is comparatively simple, its surface being composed in general of a series of roughly parallel formations crossing the county in a southeasterly direction. The western



THE DEVIL'S POST PILE—On the North Fork of San Joaquin River, five miles from Mammoth Lake by trail. Pillars are about one hundred feet high.—Photo by F. A. Edl.

portion is composed of unconsolidated sands, gravels and clays composing the nearly level floor of San Joaquin Valley.

Bordering these sedimentaries on the east is a belt of schist four or five miles wide, which contains the copper deposits comprising the 'foothill' copper belt. The schist contacts on the east with a body of granite or granodiorite that extends northward to the vicinity of Boot-jack, Mariposa County, where it obliterates the great auriferous schist and slate belt of the Mother Lode, splitting it into a number of fingers, that extend into Madera and Fresno counties on the south. This body of granite is in places coarse-grained and broken, but in the vicinity of Raymond it is of fine texture and quality, and it is here that large granite quarries have been opened.

One of the narrow tongues of schistose rocks referred to above contacts with the granite on the east and forms the Potter Ridge gold belt which contains the principal gold quartz veins of the county, worked in the Grub Gulch, Coarsegold, O'Neals and Hildreth districts.

Granite again predominates east of this schist belt, but there are areas of metamorphic rocks, especially at Mt. Raymond and in the Minarets district. Limestone and dolomite, quartzite, slates, diorite and volcanic rocks occur in these complex metamorphic regions.

Further notes on the geology of the county are contained in Reports XII, XIV and XXII of the State Mineralogist, to which the reader is referred for additional data, as the subject can be only briefly outlined here.

MINERAL RESOURCES

The mineral resources of Madera County are fairly well diversified, including as they do the precious metals, base metals and structural materials. Gold and silver have long been produced and probably will continue to be for many years, though it is believed that the crest in gold mining has been passed. Recent development indicate that the county is now entering upon a period of active exploitation of its large deposits of the base metals, lead and zinc, with which there usually is associated some copper, silver and gold. Large and high-grade iron deposits are also situated in this county and form one of its important undeveloped resources. Madera County is the premier producer of granite, ranking first in the state in the value of dimension building stone output. These granite deposits are unexcelled in quality and inexhaustible in quantity.

Other mineral resources of lesser commercial value and deposits of mineralogical interest only, include molybdenum, arsenopyrite, bismuthite, pyrrhotite carrying nickel and cobalt, wolframite, asbestos, chromite, garnet, limestone, magnesite, orthoclase-feldspar, soapstone, talc, volcanic ash and miscellaneous stone. Wildeat drilling for oil is under way.

The total recorded mineral output of the county in amount and value from 1893 to 1927, inclusive, is shown by the accompanying table. Between 80 per cent and 90 per cent of the gold and silver output credited to Fresno County between 1880 and 1893 came from that part now in Madera County. The amount so credited was \$1,350,000. Prior to 1880 there are no segregated county figures.

MADERA

Year	Gold, value	Silver, value	Copper		Brick	
			Pounds	Value	M	Value
1893	\$150,696	\$314				
1894	107,791	180				
1895	162,323					
1896	104,339	1,240				
1897	85,963					
1898	94,884	50			400	\$2,800
1899	73,758	292			439	3,070
1900	104,134	3,833	500,000	\$77,500	500	3,000
1901	82,749	2,600	108,430	17,077	500	3,000
1902	33,128	3	18,600	2,139	230	1,840
1903	93,070	3	36,000	4,680	216	972
1904	75,303	25	10,300	1,313	750	3,750
1905	50,867	10,014				
1906	23,390	508				
1907	13,303	506	1,895	379	1,250	12,500
1908	45,107	1,264	113,293	15,454	250	2,250
1909	14,716	403	5,000	635		
1910	10,076	1,850	336,667	42,876	740	3,700
1911	1,958	77	14,608	1,826	270	1,350
1912	9,162	1,162	248,129	40,941	300	1,500
1913	14,489	1,617	532,403	82,522	315	1,650
1914	4,506	36	35,359	4,703		
1915	11,214	2,126	40,294	7,051	200	1,400
1916	10,306	1,772	124,286	30,574		
1917	18,914	489	372,123	101,590		
1918	7,583	4,206	245,519	60,643		
1919	17,705	1,700	175,405	32,625		
1920	6,382	1,488	89,846	16,532		
1921	1,053	27				
1922	1,594	3,500				
1923	12,074	541				
1924	3,208	176	34,467	4,515		
1925	2,366	82				
1926	1,708	22				
1927	4,181	38				
Totals	\$1,455,000	\$42,144	3,042,624	\$545,575	6,360	\$42,782

¹Madera County created March 11, 1893, from a portion of Fresno County. Between 80 per cent and 90 per cent of the gold and silver produced in Fresno County prior to 1893 was from that part now in Madera County.

²Includes crushed rock, rubble, rip-rap, sand, gravel.

Unpatented mineral claims are not taxed in this county so that it is impossible to obtain a list of ownerships from the assessor's tax roll for checking purposes in making a survey of the county's mines or to include such a list in this report.

With the exception of the Minarets District, which was reported on in 1926 by Walter W. Bradley,¹ practically all of the mining districts were visited in September, 1928, for the purpose of bringing past reports up to date. This report covers all activities noted and includes descriptions of properties not heretofore reported upon. A general bibliography follows at the end of the text matter.

Acknowledgments.

Appreciation is here expressed for the courteous assistance rendered by mine owners and operators with whom the writer came in contact, and especially to Mr. Guy Windrom, Secretary of the Madera County Chamber of Commerce, who has shown commendable interest in the development of the mineral resources of the county.

¹Bradley, Walter W., The Minarets District, Madera County, State Mineralogist's Report XXII, Chapter 4, pp. 539-557, October, 1926.

COUNTY, 1893-1927.

Granite		Miscel-laneous stone ^a , value	Miscellaneous and unapportioned		
Cubic feet	Value		Amount	Value	Substance
48,858	\$31,494				
39,590	49,662				
48,628	73,525	\$7,800			
39,030	37,215	1,249			
23,103	49,673	500			
47,433	36,000	2,500			
124,015	80,000			\$65,000	Unapportioned, 1900-1909.
96,716	294,799	600			
105,845	78,041	4,000			
128,581	389,800	1,000			
113,627	98,083	500			
42,316	123,106				
65,472	176,416				
99,278	93,372				
140,086	123,668	2,140	2,279 lbs.	84	Lead
142,622	111,380	5,836			
99,192	74,152	1,112			
99,900	74,190	800			
82,135	56,058	3,213	5,533 lbs.	249	Lead.
150,994	270,123	1,466			
	186,543	6,221	50 tons	1,000	Pumice.
	84,632	37,640		1,000	Other minerals.
128,865	172,191	7,915			
	114,400	1,325	221 lbs.	19	Lead.
	40,355	1,540			
	64,358	1,500			
	98,523				
	461,822	4,765			
	454,222	16,948			
	486,670			18,750	Other minerals.
	935,820	11,750			
	1,358,410	16,600			
	418,683	5,325		1,055,447	Granite paving blocks, miscellaneous stone.
	\$7,197,386	\$144,445			
				\$1,141,549	

ASBESTOS

Amphibole asbestos occurs at the Savannah Mine near Grub Gulch, stated to be four feet wide, and traceable for several miles. It is also found at the Baker Mine near Coarsegold. The deposits are undeveloped, there having been no commercial production.

CLAY

Common brick clay is reasonably abundant in the valley section of the county. The Sunset Brick Company (also known as Dyer's Brick-yard) operated at Madera for time, but it has been idle for the past ten years.

COBALT (See under Nickel)

COPPER

The foothill copper belt, which extends along the eastern edge of the San Joaquin Valley for many miles, passes in a southeasterly direction through Madera County a few miles west of Raymond and extends on into Fresno County. It maintains the same general characteristics

here that it does farther north. Copper mining began along this belt in Calaveras County about 1860, and a number of mines were soon opened up in Madera County. Before 1866 the Buchanan Mine was operated and with the aid of a small furnace 150 tons of copper bars had been shipped. Ore was also shipped from the Daulton Mine to Swansea, Wales, during the sixties. Following this early period of activity, the price of copper fell, and at most of the properties a long period of idleness followed.

A later attempt at mining and the reduction of copper ore was made by the California Copper Company about 1900, and a smelter was built at Madera, but after four months the mine and smelter closed down. Since then only an occasional carload of ore has been shipped from the county to custom smelters. During the past two years renewed interest has been shown in the copper deposits in this county, and two properties in the foothill belt are now being actively developed.

Copper ores also occur in the Mt. Raymond district at Hogum, associated with iron, and in the Minarets district in the high Sierra.

The following notes cover present activities and properties not heretofore described in earlier reports:

Bach Property. Copper ore, carrying considerable silver values, occurs on the Bach Ranch of several thousand acres, situated four miles northwest of Daulton Station on the Berenda-Raymond branch of the Southern Pacific. Owner, R. C. Bach, 1133 North San Joaquin Street, Stockton. The foothill copper belt crosses the property and prospects have been found at a number of places. Since 1925 a shaft has been put down 70 feet on one of the outcrops and a drift at the bottom run 100 feet along the vein. Samples were obtained in the drift which assayed: (a) Au, \$3.30; Ag, 43.84 oz.; Cu, 23.80%; and (b) Au, .62; Ag, 70.40 oz.; Cu, 28.30%, but in general the values are distributed and no large body of ore was found in this working. If the entire property was thrown open to leasers it is possible that a considerable tonnage of shipping ore might be developed or enough lower grade ore found to justify a concentrating plant.

Daulton Mine. This old copper property which comprises 60 acres of patented land was taken over in 1927 by the *Madera Mining Company*, J. Oscar Smith, president and manager; C. P. Colloneus, secretary; home office, 1241 Pacific Mutual Building, Los Angeles; local address, Box 207, Madera.

The mine is in Secs. 25 and 35, T. 9 S., R. 18 E., about one mile southeast of Daulton Station. Copper and zinc sulphides have formed replacement orebodies in the schist.

Soon after acquiring the property, the old incline shaft was deepened from 85 feet to 135 feet. A drift 100 feet in length was run on the 135-foot level on a vein which shows 18 feet of ore averaging 3.75% Cu and 7% Zn, apparently an altered schist. At this point, operations were stopped until electric power could be brought in. This was installed in the spring of 1928. Since then a new vertical 2-compartment shaft has been started, which was down 190 feet at the time of visit. This shaft is on the foot-wall side and it is the intention of the company to cut a station at 200 feet and cross-cut back to the vein. There is estimated to be 50,000 tons of ore in sight at present and completion of the

above work will double that amount. If the expected tonnage is developed a treatment plant will be erected. This will probably be a plant for the production of zinc oxide followed by leaching of the residue for copper or a flotation plant for the production of copper and zinc concentrates. Water is obtained from wells and the mine makes a small amount. The mine is well equipped with all necessary buildings, assay office, laboratory, etc. Power is furnished by the San Joaquin Light and Power Company. The management has had experience in handling Arizona copper ores and appears to be reopening the mine on a business-like basis with technical supervision. Eleven men are employed.

Bibl: State Mining Bureau Bull. 50, pp. 272-274.

Jessie Bell Mine. This mine is situated on the Daulton and Buchanan ranches in Sec. 24, T. 9 S., R. 18 E., and is another of the old foothill copper properties that has been prospected and worked intermittently for high-grade ore since early days.

In 1926, S. A. Lines, Fresno Hotel, Fresno, took over the mine and has been operating since. Work was begun on the Buchanan at the north end where there is a 100-ft. shaft. A drift was run south on a vein from one to six feet wide to the Jessie Bell. The vein matter is schist, impregnated with chalcopyrite, in places showing rich streaks and bunches. The ore carries very little zinc but runs about \$10 per ton in gold. Two cars of high-grade selected ore have been shipped.

On the Jessie Bell a 200-foot shaft was put down and drifting is being continued, developing a lower-grade orebody for milling. There is considerable milling-grade ore on the dumps. Water is obtained from the mine. The hoist and compressor are run by gas engine. Eight men are employed, with L. M. Bradford, superintendent, in charge.

DOLOMITE AND LIMESTONE

Except in the metamorphic areas at Mt. Raymond and in the Minarets district where some large masses of limestone occur, usually more or less silicified, good limestone deposits are rare.

Scott Deposit. S. A. Scott, Coarsegold, owns a number of claims situated six miles east of Coarsegold. The property may be reached from the Madera-Yosemite road by automobile. The Minarets and Western railroad passes within three miles, but it would be necessary to build some road to reach the railroad at this point. Part of the claims were at one time held by the Good Shepherd Mining Company, there being a gold lead on the property; the vein being associated with wollastonite and limestone. The limestone ledge is about 60 feet wide, but is siliceous. A banded green and pink siliceous dolomitic marble that takes a good polish and which would make beautiful decorative panels, also occurs in this belt. In an adit on another of the claims Mr. Scott has been taking out a soft decomposed material which contains a small amount of water-soluble salts showing the presence of phosphate and potassium. He has been using this material as a fertilizer on fruit trees and reports excellent results from its use.

GEMS

Specimens of turquoise have been found at the Taylor ranch on the Chowchilla River, north of Madera; garnets at Grub Gulch and Fresno Flats; and andalusite on the Chowchilla River, north of Madera; but no commercial production has ever resulted.

Bibl: Bull. 37, pp. 52, 107; Bull. 67, pp. 121, 128, 163; Geological Reconnaissance in California, W. P. Blake, 1858, pp. 304-306.

GOLD (Lode Mines)

There is at the present time very little activity in gold quartz mining in this country. Literally thousands of claims have been located during the past 50 years and reached various stages of development, production and decline. At the time of the last general report upon the mines (Report XIV, 1914), only three properties had been recently active; the Enterprise, the Gambetta and the Texas Flat. All of these are now idle, but some work of intermittent character is still being carried on by individuals or small groups, and a few thousand dollars in gold is annually produced.

Ahwahnee Group of Claims. This group of eight claims was acquired by Belle McCord Roberts, of Long Beach, in 1927, who, it is reported, expended about \$8,000 in running a crosscut tunnel to intersect the mineralized zone, which prospected well on the surface; but without developing any ore. The tunnel evidently did not reach the mineralized zone or the vein pinched out. The group is situated on Potter Ridge between the Enterprise and Lucky Bill Mines. Idle.

Eagle Mine. Owners, Noble and H. C. Melvin, Coarsegold. Discovered in 1921. Located in the Potter Ridge district on Deadwood Gulch three miles northwest of Coarsegold. The orebody consists of a mass of quartz stringers and veins in schist and slate. The owners sunk a shaft 30 feet and drifted on the vein 75 feet. They equipped it with an arrastra, but its capacity was small. A recovery of \$7 a ton was made from all of the vein worked, but a very heavy flow of water was encountered, and operations ceased after a short period of activity. Idle.

Bibl: State Mineralogist's Report XVIII, p. 306.

Gold Ribbon Mine is situated in the Potter Ridge district a short distance north of Coarsegold and not far from the Texas Flat. Development work here recently uncovered a high-grade ore-shoot, and the property has been turned over to Capt. John A. Hassell, 812 Chester Williams Bldg., Los Angeles, who is continuing operations.

One or two other properties in the vicinity of O'Neals have been worked more or less by individuals.

Mud Springs Mine, which was being developed by the Italian-American Mining Company in 1922, is again idle.

Lucky Bill Mine. This mine is situated in Sec. 18, T. 7 S., R. 21 E., about two miles southeast of Ahwahnee, on the east side of Potter Ridge; under bond to Fred G. Low, 1608 Delaware Street, Berkeley; local address, Ahwahnee. It comprises two claims, having an area of 40 acres. The mine was discovered in 1880 by an Indian and during

the intervening time considerable ore has been taken out at intervals by different parties, it having been equipped with a 2-stamp mill and an arrastra in the past. Considerable ore has also been milled at the adjoining Enterprise mill.

The country rock is mica schist and slate; the vein dark, granular and glassy quartz carrying free gold and minor amounts of white iron, marcasite. Thirty years ago Low worked at the mine, at which time a run of 1000 tons of ore gave returns of \$16 a ton, free gold, and \$1.50 in the sulphides. Returning to the mine in 1927 Low secured a bond on it in April, and has been carrying on development work since. During the past year he took out 500 tons of ore, which was hauled by truck to the Enterprise mill and gave returns of \$6,000.

The mine is opened up by two adits, 100 feet vertically apart. There is also a 100-foot winze, not on the vein, and a raise to the surface. Some other old workings are now partly closed. The vein swells, and the orebodies are in the form of lenses and chimneys up to 45 feet maximum width. Removal of ore has left open stopes of large size with much ore still exposed in the bottom. The mine is equipped with a 50-hp. Diesel engine and compressor, track, cars, tools, etc. Water is scarce during the summer, but there is plenty in the gulch during the winter, and springs furnish a supply for domestic use. When visited, the mine was shut down on account of lack of water, and the owner was engaged in erecting a 10-stamp mill at the mouth of the lower adit. This mill is about two-thirds completed. The mine is readily accessible, being situated at an elevation of 2800 feet and reached by good road. Scattered oak and pine cover the hills. Mining costs will be low, and upon completion of the mill the results of operation should be quickly realized.

Bibl: State Mineralogist's Report XIV, p. 546; XIII, p. 210.

Riverside Quartz Mine is owned by T. G. Jordon, of O'Neals. It is situated on San Joaquin River, below Hildreth, and has been equipped with an arrastra for a number of years. During the present year some additional machinery, including a small mill, was installed. E. A. Patterson, of San Francisco, is associated with Jordan in its operation.

Spangle Gold Mining Company. R. D. Noble, secretary, Yosemite, California. This company has three claims in Sec. 8, T. 8 S., R. 20 E., about nine miles east of Raymond in the Potter Ridge district. The country rock is granite. This property was last active in 1925. Equipped with a 2-stamp mill. The mine makes a large amount of water. It is a short distance north of the property of the Stayton Mining Company.

Stayton Mining Company. The property consists of four claims in Secs. 8 and 9, T. 8 S., R. 20 E.; operated intermittently from 1915 to 1922. Idle for several years.

Bibl: State Mineralogist's Report No. XVIII, pp. 306-307.

Texas Flat Mine (Kroromick Mining Company.) This mine, which was developed to the 1200-foot level and active until 1927, is now idle. It has passed into the control of Wm. Krone, of Coarsegold. The ore-shoots rake to the north at a flat angle, and the last work done was on a long drift to the south to intersect an ore-shoot, proved on the surface

on the south end of the property. This drift was not completed. In May, 1927, the 20-stamp mill burned to the ground, and the mine was shut down. Negotiations are now under way for reopening the property, it being proposed to sink a new 500-foot shaft to the south ore-shoot which, on account of its flat rake, will give backs of more than double that footage.

Bibl: State Mineralogist's Report XVIII, p. 304; XIV, p. 551; XIII, p. 213; XII, p. 164; VIII, p. 212.

Among the other well-known quartz mines of the county, some of which have good past production records, are:

Abby, Ackers, Caledonia, Canary, Casady View, Colorado, Daisy, Empire, Enterprise (may be reopened), Flying Dutchman or Hoboken, Freda, Gambetta, Hanover, High Grade, Hornets Nest, Josephine, Lady Ellen, McKenzie-Minturn, Millenium, Morning Star, Mud Springs, Quartz Mountain, Ragesdale, Savannah, Smuggler, Starlight, White Rock.

A few of these are patented properties. At the others assessment work is usually kept up and occasionally a little gold is taken out.

GOLD (Placer Mines)

The present-day channels and bars of the streams flowing down the western slope of the Sierra Nevadas in the area now embraced in Madera County were the scene of intensive placer mining in "the days of 49" and for a few succeeding years. Though very rich in places, the deposits were shallow, comparatively small, and they were soon worked out.

There was some work done on the upper San Joaquin and its tributaries, but no great amount of gold was taken out. Tributaries of Fresno River were also worked; Grub Gulch being mined for several miles toward the river. Above Grub Gulch on Kings Gulch is a fragment of an old channel which was drifted without much success.¹ Coarsegold creek, as its name implies, was noted for the coarse and heavy character of gold recovered. The source of its enrichment has never been satisfactorily determined, as the placer gold differs materially in fineness and other characteristics from that in any known ledges which might have fed it.

Prospectors looking for a grub-stake still occasionally do a little prospecting in this area. Returns are usually negligible but within the past month a nugget weighing $1\frac{1}{4}$ ounces was found on what was apparently a little piece of virgin ground. Finegold creek and other streams also contributed to the early day output. The gravels in the vicinity of Friant on San Joaquin river contain a few cents per ton in gold, one of the rock-crushing plants located there (Fresno County side) recovering one to two cents per ton as a by-product.

While the placer mining industry in Madera County is now largely a matter of history, there is one placer operation under way at the present time which promises to be of some importance.

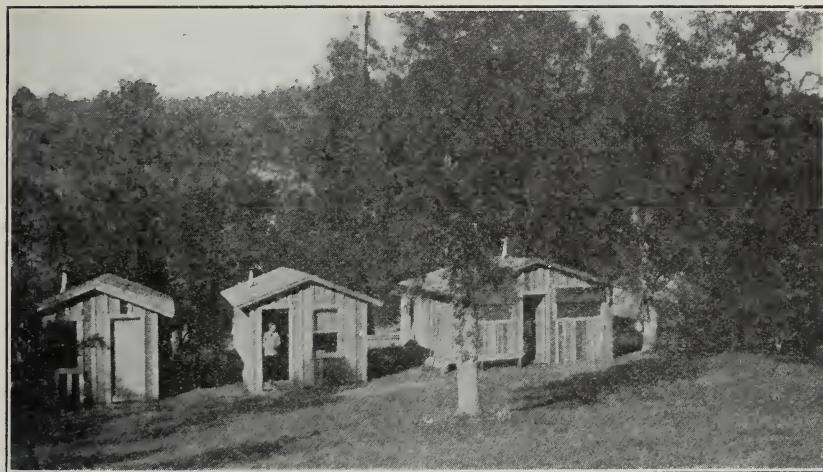
Paragon Placer Mines. This property is situated in Secs. 3 and 4, T. 8 S., and Secs. 33 and 34, T. 7 S., R. 19 E., $4\frac{1}{2}$ miles northeast of

¹ Haley, C. S., Gold Placers of California, State Mining Bureau Bulletin No. 92.

Raymond on the road to Mist. The holdings comprise 400 to 500 acres covering the bed of Chowchilla River for two miles, together with some upper gravel benches and back channels. Owner, Paragon Placer Mines (a partnership) Chas. J. Stoneham, president and manager, 610 West Santa Barbara, Los Angeles; local address, Raymond.



Property of Paragon Placer Mines on Chowchilla River, Madera County.
Photo by courtesy of the Company.

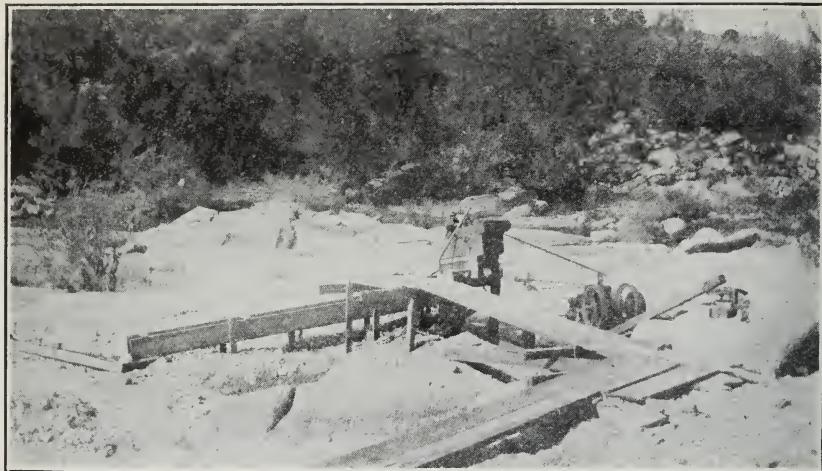


Main Camp, Paragon Placer Mines, near Raymond, Madera County.
Photo by courtesy of the Company.

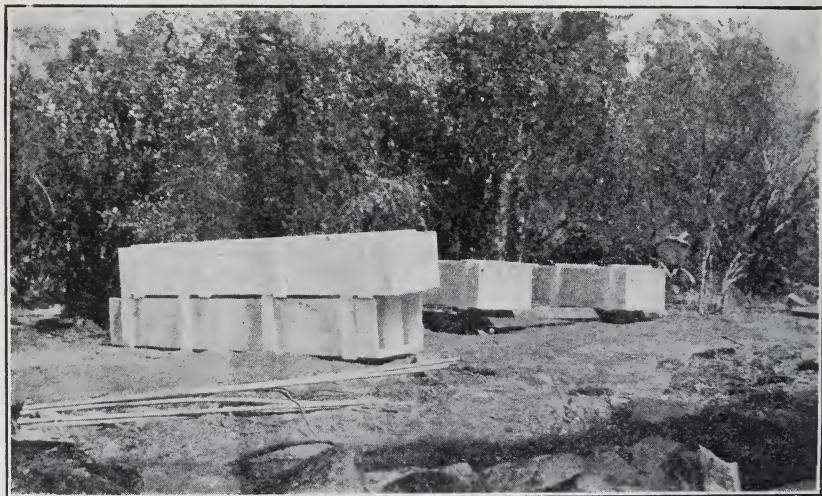
The gravel ranges in depth from 4 to 28 feet. It contains considerable black sand and some boulders. A sampling plant and camp buildings have been installed, and systematic sampling and prospecting has been carried on, indicating values of about 50 cents a yard. It is proposed to mine the gravel by steam shovel and transfer it to the washing plant in cars or by belt conveyor, using gasoline power. Most

of the gold is fairly coarse, but there is also some flour gold. The grade of the river is lower over this stretch than both above and below it. Water is obtained from the river.

A special effort will be made in the washing plant to recover all valuable constituents of the sand and gravel, using riffles, undercurrent,



Sampling Plant, Paragon Placer Mines, Raymond, Madera County.
Photo by courtesy of the Company.



Twin sluice boxes being installed at Paragon Placer Mines, Madera County.
Photo by courtesy of the Company.

cocoa matting and rubber mat. Twin sluice boxes are being installed to avoid shut-downs in cleaning up.

Most of the preliminary work has been completed, and installation of the steam shovel and washer is to follow.

GRANITE

For more than 25 years past the production of granite has been the chief mining industry in Madera County the well-known 'Raymond' granite quarries having been a most important contributor to the state's total output during that time, with promise of continued leadership for years to come. Two large quarries, situated within a mile of each other and both with direct rail-shipping facilities via the Berenda-Raymond branch of the Southern Pacific railroad, have been operating



New Los Angeles City Hall. Exterior and interior granite from McGilvray Raymond Corporation's quarry, Madera County.

with varying activity since the 80's. These were known as the McGilvray Raymond Granite Company (formerly McLennon Quarry) and the Raymond Granite Company (also known as the Knowles Quarry). The rock is similar in both quarries, though with some difference in occurrence of natural cleavage planes and color. 'Raymond' granite is noted for its fine uniform texture, beautiful light color, its excellent weathering qualities and freeness in working the latter quality making the stone particularly adaptable to fine structural carving. In these

features it is not excelled by any other building granite found in this state or elsewhere.

A merger of several of the leading granite-producing companies just consummated (October, 1928), including the two mentioned above in Madera County, will bring all operations in the 'Raymond' district under one management, and it is expected will increase considerably



Granite quarry of McGilvray Raymond Corporation, Raymond, Madera County.

the local activities due to the transfer of finishing operations from quarries owned in other counties, to Raymond.

The new company is known as the *McGilvray Raymond Corporation*; John D. McGilvray, president and manager; H. L. Knowles, secretary; home office, 3 Potrero Avenue, San Francisco. The McGilvray Raymond Corporation will own and operate the McGilvray Raymond Granite Company's quarries at Raymond, Madera County, and Lakeside, San Diego County; the Raymond Granite Company's quarry at Raymond, and the California Granite Company's quarries near Porterville, Tulare County, and at Rocklin, Placer County. It is the intention of the corporation to ship the rough granite from the various quarries to Raymond for finishing and to maintain only two city offices, one in San Francisco and one in Los Angeles; thus centralizing operations and management and reducing overhead costs. When these steps are completed, the finishing operations at Raymond will probably require 500 to 600 men, more than doubling the present Raymond pay roll.

An interesting description of quarry and operations formerly carried on by the Raymond Granite Company, now McGilvray Raymond Corporation, was recently published¹ in 'Cement, Mill and Quarry' and is here reproduced in part:

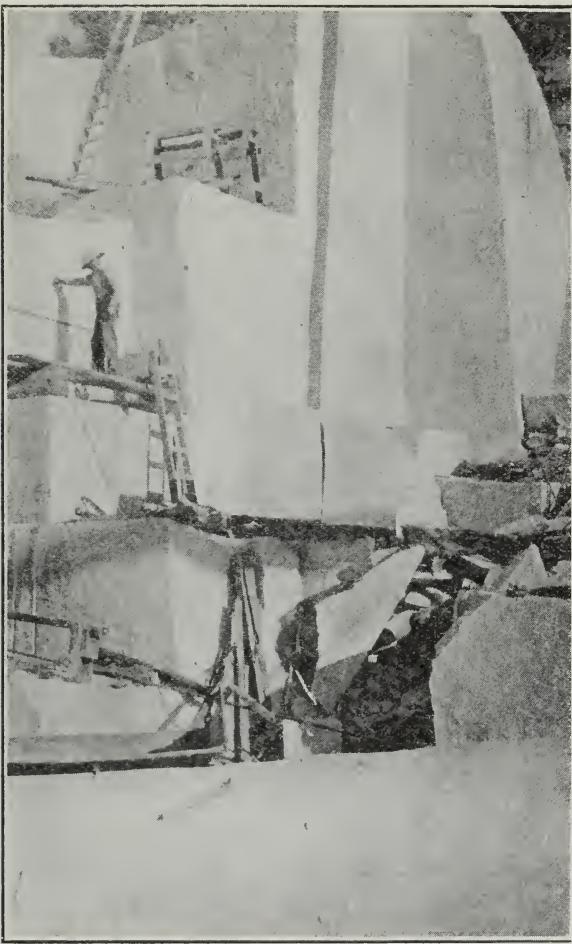
"Quarrying operations are conducted on the westerly slopes of a granite mountain. The distance down the slope from the crest of the deposit to a level bench where the yards and cutting sheds are situated is approximately 1200 ft., and this sloping face on which quarry work is carried on has a lateral extent of nearly 3000 ft. Between the yard level and the top of the slope is a vertical distance of 180 ft.

¹Quarries and Cutting Plant of Raymond Granite Company; Cement, Mill and Quarry, Chicago, Ill., June 20, 1927.

"By a system of channeling and drilling the granite is blasted out in blocks of from 30 to 1000 tons and in some cases greater. The larger ones are drilled and broken by explosives into smaller blocks that can be dragged by derrick and cable down the slope to the yard area. On some of the steeper pitches blocks of from 100 to 1000 tons or more are rolled some distance by force of gravity.

"In breaking the blocks to sizes that can be handled by derricks, rows of holes are drilled by jackhammer drills, and two 4-in. reamer cuts are made off each hole so that the blasts will make a straight-line break instead of shattering the block.

"There are eight derricks installed at advantageous positions so that the operating radius of any one of them may reach to that of one or two of the others. Some of these are stationed for moving the granite blocks from various parts of the quarry to the yards; others are for loading the granite in smaller blocks onto cars by which they are hauled from the yards to the cutting sheds. Of the eight derricks, No. 1 is a 60-ton rig with a 100-ft. boom, operated by a steam hoist. No. 2 and No. 3



Granite Quarry of McGilvray Raymond Corporation,
Raymond, Madera County.

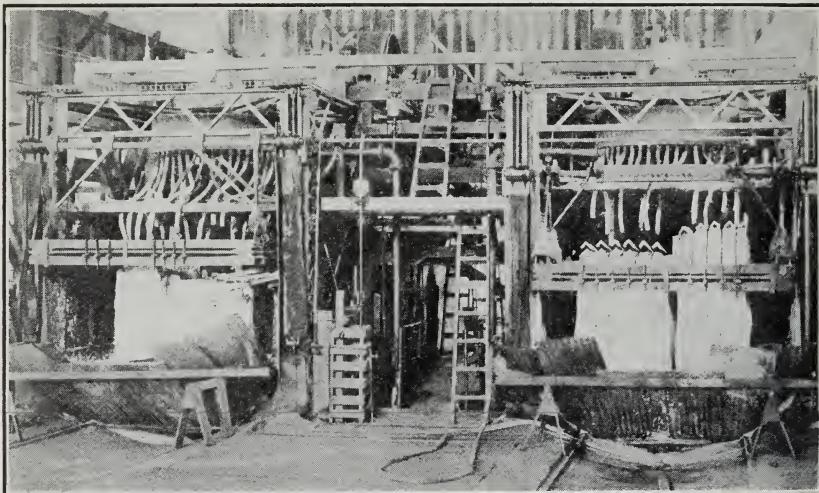
are steam derricks of 30 and 40 tons, respectively. Then there are four air and one electric, each of 20 tons capacity.

"In the yards the blocks are drilled and broken to the various sizes required in the cutting departments. A block typical for those purposes is about 12 by 4 by 5 ft.

"The cutting sheds in which the sawing, surfacing, cutting and other operations are performed are over 400 ft. long, divided into five parallel, longitudinal runways. Each runway is served by an electric traveling crane of 46-ft. span. Two of these runways, however, are equipped with two cranes each. The crane capacities range from 15 to 40 tons. Now, the yard railway, 36-in. gage, cuts through the shed area,

running at right angles to the runways, and granite blocks on the yard cars are picked up by the traveling cranes and delivered to various machines and pneumatic tools. In like manner, the finished products are lifted by the cranes and loaded onto the same cars for transfer to the standard-gage cars.

"The initial operation in the cutting plant is sawing the granite blocks into slabs of thicknesses ranging from 4 to 14 ins. This is done by motor-driven, belt-connected gang saws and rotary saws. There are two gang-saw units of eight blades each, the unit being operated by a 100-hp. motor. Each individual blade makes a vertical cut of 2 ins. per hour. There are two circular saws, made by the Parker Rotary Saw Co.



Gang Saws in Finishing Plant of McGilvray Raymond Corporation, Raymond, Madera County

"The smaller unit comprises a circular saw blade $7\frac{1}{2}$ -ft. diam., set with steel teeth. This is driven at a peripheral speed of 4000 ft. per minute by a gear-connected 50-hp. motor. The saw cuts to a depth of 2 ins. per minute. The entire unit is supported by a heavy steel frame resting on concrete. The larger saw of this type consists of two circular blades, 11 ft. 8-in. diam., carried on the same shaft. These are driven by a 150-hp. motor through a leather transmission belt running on 16-ft. centers.

"The largest machine tool in the works is a motor-driven turning lathe, capable of swinging a block of stone 32 ft. long and 7-ft. diam. This is utilized for producing granite moldings, columns and other circular shapes from a block of rough stone.

"The second stage of work here is that of the 22 surfacing machines, operated by compressed air. This is followed by cutting the surfaced slabs to special dimensions by pneumatic cutters, of which there are about 300 in the plant. The exposed faces are subjected to an abrasive process, then carborundum grains No. 8 are applied to the surface by a cast-iron scroll wheel to make it smooth. Finally, a luster is imparted by applying oxide of tin with a felt buffer.

"An interesting and important accomplishment at these works in the last two years was the development and construction of a boring machine for producing circular granite columns. Its mechanism is such that either a solid or hollow column may be made of various diameters from 12 ins. up to 6 ft. and of any height up to 17 ft. These numerous sizes are determined by the sizes of the $\frac{5}{8}$ -in. steel drums that may be fitted to the machine. The lower, circular edge of the drum is set with carbon steel teeth or cutters, $1\frac{1}{2}$ ins. thick. The drum with its steel cutters is rotated at 90 r.p.m. by a 30-hp. gear-connected motor.

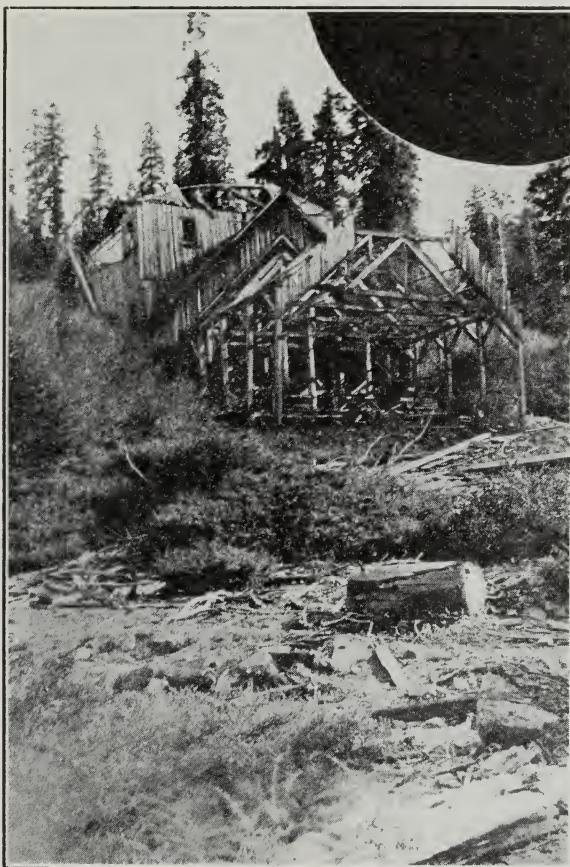
"The power house is equipped with two 150-hp. boilers and three reciprocating engines for driving one 625-cu. ft. air compressor and two electric generators of 50 and 100 kw., respectively. These generators produce direct-current energy for the traveling cranes and for electric hoist on an inclined surface tramway. There are five other air compressors, a combined capacity of 2000 cu. ft. per minute, which are driven by electric energy from the lines of the San Joaquin Light and Power Co. and which supply air to all pneumatic tools. The numerous large capacity alternating-current motors that drive the gang and rotary saws, lathe and boring mill derive their energy from the same source."

The merger will make available practically double this equipment, as the McGilvray Raymond Company's quarry is similarly equipped.

Another development at Raymond is use of the sand blast in cutting

inscriptions or decorative figures on the granite. A special soft rubber composition is heated and spread evenly over the entire surface to a thickness of about one-eighth inch. After cooling, the letters or other designs are then cut out from the composition and the sand blast used to remove the exposed granite. By this means the design may be cut in deeply and rapidly, leaving very clean sharp edges. When finished, the rubber composition is stripped from the rest of the surface and can be melted down again and reused.

The following historical note may not be out of place here. In 1852 Major James D. Savage, the discoverer of Yosemite Valley, was killed



Old concentrating mill of Star Mine, Mt. Raymond District,
Madera County. Photo by Guy Windrom.

by Judge W. H. Harvey, of Tulare County. His body was brought back and buried near his trading post on the Fresno River about 20 miles above Madera. Major Savage's partner, Dr. Leach, sent to Connecticut for a granite monument. This was shipped around the Horn and overland by mule team from Stockton and set up, where it stands today within five miles of the largest granite quarries on the Pacific

coast. This granite shaft and the old trading post may be seen in the distance from the Madera-Yosemite road.

Bibl: State Mineralogist's Report XVIII, p. 305; XIV, pp. 559-566; XIII, p. 620; XII, p. 384; X, p. 189; Bull. 38, pp. 30-32.

LEAD—ZINC—SILVER

Lead-silver and zinc-lead orebodies, with which copper, gold and silver are often associated, occur in important deposits in two districts; namely, the Mt. Raymond district and the Minarets district.

One day was devoted to a reconnaissance of the Mt. Raymond district by horseback.

Mt. Raymond District.

The ridge of which Mt. Raymond is the culminating peak is roughly horseshoe-shaped with the opening to the west and Mt. Raymond to the north. The district lies mainly in T. 5 S., R. 22 E., the mountain peak, elevation 8548 feet, being in Sec. 9. The mineralized area is only two miles east of Mariposa Grove of Big Trees in Yosemite Park, but is best reached from Fish Camp on the Wawona road. A passable road but with some steep grades runs from Fish Camp about five miles northeasterly to the old Star Mine mill on the south slope of the mountain.

The district, which includes White Chief Mountain and Iron Mountain, is made up largely of metamorphic rocks, the main body of which is quartzite. This has been intruded by masses and dikes of igneous rock, which exhibit many facies, including felsite, aplite, porphyritic granite and typical granite, all showing numerous fracture planes. The orebodies are in veins and mineralized zones with general northeasterly strike and standing nearly vertical. Sphalerite, galena, magnetite, pyrite and chalcopyrite were the principal minerals noted.

The veins have been but slightly developed, the only productive property having been the old *Star Mine* on the summit and north slope of Mt. Raymond. This mine was discovered in 1888 and was worked by open cut or glory hole in which can still be seen a wide face showing lead and zinc sulphides.

Soon after its discovery, a concentrating plant (locally called the jig mill) was built. A 7000-foot aerial tram, which crossed the present S. P. Group of claims, connected the mine and mill. The latter was run by water power. It measured 136 feet in length by 60 feet in width and 68 feet in height. It had a stone foundation and is said to have cost \$40 000. A Blake crusher, Cornish rolls, jigs and buddles were the principal machines used in concentrating. After about one year of operation the mine shut down and the tram and mill are now in ruins. The Star Mine is owned by Mrs. Edith M. Whittlesey, of San Francisco. It will probably be included in the contemplated extensive development of the S. P. Group adjoining on the south.

During the past two years a considerable number of claims have been located and more or less developed. Other prospects said to show high-grade outerops are known, but some of the few parties well acquainted with the area prefer to wait "till something starts in the district" before locating claims.

The *Bradford Group of Claims* (formerly the *Biladeau* property) is the most westerly group. There are six claims, owned by L. M. Bradford, Box 207, Madera, situated on the southwestern slope of Mt. Raymond. The ore carries zinc, copper, gold and silver; the gold and silver values being higher here than at most of the other properties. Assays have shown copper up to 23%, \$12 in gold and 12 ounces of silver a ton.



Adit on S. P. Group of Claims, Mt. Raymond District,
Madera County. Photo by Guy Windrom.

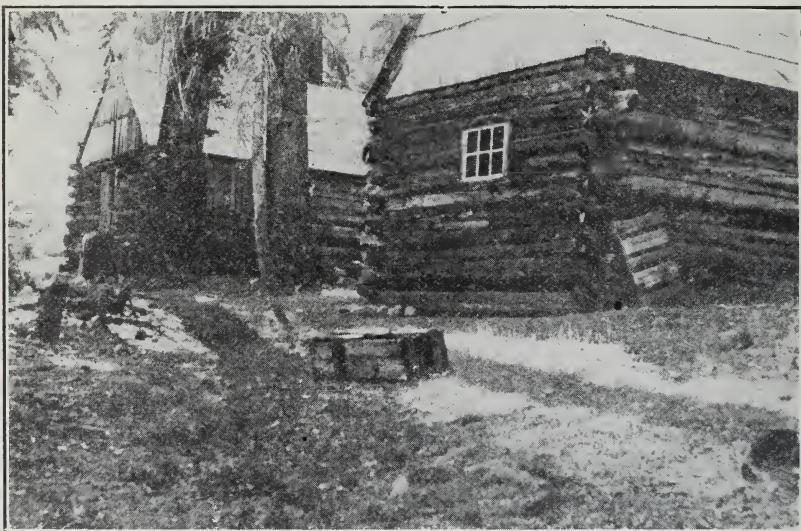
S. P. Group of Claims. East of the Bradford Group on the south slope of the mountain below the Star Mine is the S. P. Group of eight claims, owned by John Broad, 1535 Chestnut Street, Oakland; John Francis and W. L. Funkhouser, of Madera. The claims include the Buena Vista, Wonder, Blue, Zinc, Pilot, Keystone, Boulder and Alta. Most of the work has been done on a ledge from 10 to 20 feet wide which has been exposed for about 1000 feet running toward the top of the mountain. An adit, in 40 feet, shows good zinc ore across the face, and numerous other cuts and shallow workings expose the vein. A

little higher up and westerly on the Blue claim three feet of argentiferous galena shows strongly in another vein. The slope of the mountain is steep and a tunnel at this point would give backs of 500 feet on the vein, and if continued would tap the Star orebody. Negotiations are under way looking to the acquisition of this group and the Star Mine above it, which it is proposed to develop by driving a tunnel through the top of the mountain, which would permit the easy working of both properties.

Southeasterly from the S. P. Group and Star mines are the *Francis* and *Scandia* properties with similar large zinc-copper ore showings. Zinc predominates in the vicinity of White Chief and limestone occurs in this area.

IRON

Along Iron Creek, in the vicinity of Hogum, the *Vulcan Copper Company*, Care of Robert S. Fletcher, 342 Madison avenue, Manhattan,



Cabins at Iron Deposit, Hogum, Mt. Raymond District, Madera County. Photo by Guy Windrom.

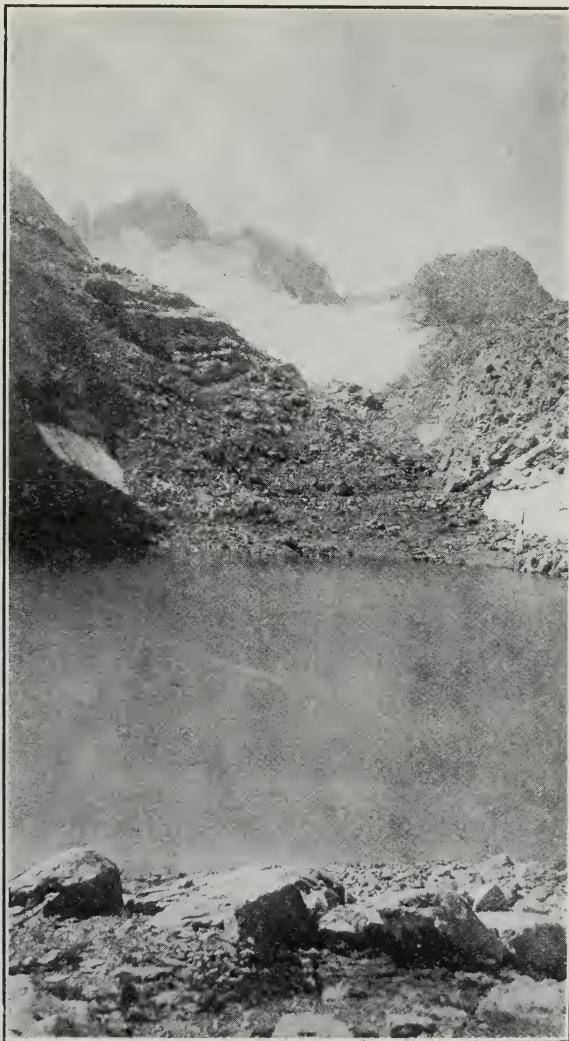
New York, has done considerable work in the past; the ground having been diamond drilled. The holdings are in Secs. 1, 12 and 14, T. 5 S., R. 22 E., and Secs. 6 and 7, T. 5 S., R. 23 E. There are some nine claims and a mill site. Several old tunnels, shafts and other workings are in evidence and chunks of ore, mainly magnetite and pyrite, are piled on the dumps. These orebodies appear to be segregated lenses in the granite and not continuous. Only a little copper stain was seen.

The *Hart Iron Deposit*, owned by Augusta A. Hart, of Fresno, is in Secs. 15, 22 and 23, T. 5 S., R. 22 E. Many shallow pits and shafts have been sunk, indicating a large deposit of iron ore, magnetite and hematite showing over $1\frac{1}{2}$ miles in length, which probably occurs in the form of lenses, though of more massive type than at Hogum.

Timber and water are abundant in the district. With transportation facilities improving rapidly, the zinc-lead deposits appear to be on the

eve of commercial exploitation, while the iron deposits constitute a mineral reserve awaiting further developments in the iron and steel industry on this coast.

Bibl: State Mineralogist's Report XIV, p. 554; XI, p. 214; X, pp. 191-193; Bull. 38, p. 298.



Bliss Lead-Silver Group. Vein runs parallel to small snow bank showing at left center. Minarets District, Madera County. Photo by H. M. Bliss.

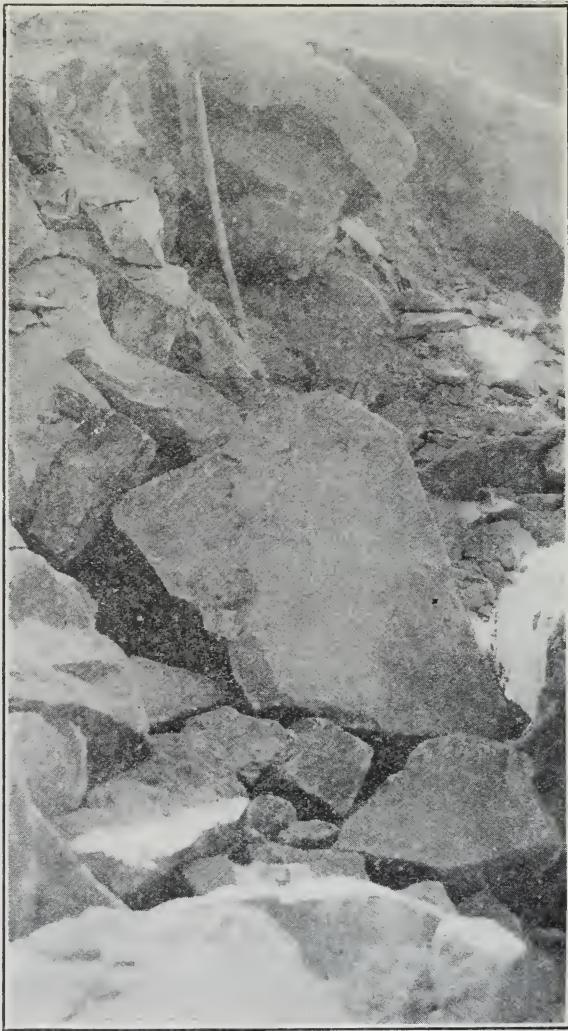
Minarets District.

This district was not visited by the writer, as a comprehensive report upon its mineral resources, accompanied by a map of the district, was made by Walter W. Bradley¹ and published in Octo-

¹ Bradley, Walter W., The Minarets District, Madera County, Mining in California, October, 1926. State Mineralogist's Report, XXII, pp. 539-557.

ber, 1926. Some additional data in regard to a few of the properties and notes on activities since then are included herein.

Agnew Meadows Mining Corporation is a newly formed company recently granted a permit to sell stock for the purpose of developing their holdings covering a deposit of lead-silver-gold ore. The officers



Outcrop of lead-silver ore on Bliss Group, width 15 to 16 feet. Minarets District, Madera County. Photo by H. M. Bliss.

are Frank Shaw, president; A. L. Aylmer, vice president, and L. E. Smith, secretary; home office, Compton, California.

Bliss and Barcroft Properties. These two groups of claims are situated on the west side of Banner Peak and Ritter Mountain, respec-

tively. They are shown on the map accompanying Bradley's report,¹ but being west of the divide, they were not accessible to him.

The two groups are adjacent, and their ores are similar, being mainly argentiferous galena. The deposits are in a metamorphic area, slates and volcanics comprising the immediate country rock, with granite two and one-half miles west. There are three large and two small veins, which have been traced for several thousand feet in length. The greatest depth opened up is 50 feet and the greatest width of vein exposed, 22 feet.

The following is a list furnished by Mr. Bliss of samples taken and assays reported by Abbot A. Hanks:

Bliss Property.

Samples Nos. 1, 2, and 3 were taken from the outcrop of the Bliss location (a surface sample of three large boulders) ranging in weight from about five to six tons, perhaps greater weight, owing to the metallic composition.

No. 1 sample taken from the outcrop of the north wall side.

No. 2, from the center of the Bliss outcrop.

No. 3, taken from the south wall of the Bliss location.

These samples represent about six feet of vein matter, and were taken to a fair representation of the value of this outcrop.

No. 4, taken from the south wall of the Bliss location, about six inches wide, a part of the deposit adhering to the south wall.

No. 5, a selected sample of Galena from the Bliss location, an effort to show values of the best samples visible of the Galena ore.

No. 6, a sample of the Oxides, selected from a mass on the south wall of the Bliss location, and the bottom of the vein matter, the deepest sample taken. This was secured from the bottom of the large float boulders, which value is represented in samples Nos. 1, 2 and 3, Bliss location. No check retained on this sample, all a fine powdered material.

No. 7, sample all Galena from the Bliss location, a sample to show the Galena value only.

No. 8, brittle silver sample on single piece from Bliss location. No check sample retained.

No. 9, sample taken from what is termed the west extension of the Bliss location, about 500 west from the Bliss discovery, this is presumed to be, and indications justify that belief that is the same vein as shown in the outcrop of Bliss discovery.

No. 10, sample of fines taken from Bliss discovery, part of which we panned on the property, showing a good concentration of metal in this product. Assay will determine value.

Barcroft Property.

Sample A, vein casing on vein side of Barcroft location, about 150 feet from the Barcroft shaft. This sample is on the wall, six feet from the south wall of vein; sample will be assayed for copper, silver and gold.

Sample B, taken from the east exposure of the Barcroft vein, about 150 feet from shaft, same place as sample A. Sample A not included and representing about six feet of vein matter.

Sample C, taken about 150 feet from Barcroft shaft same place as samples A and B and indicating two feet of the center of the six feet of vein matter. This sample appears to be the best portion of the vein. Assays will indicate the merit of this conclusion, and determine the average value of the entire vein.

Sample D, taken from a dump of about four or five tons recovered from the Barcroft shaft. This sample was a grab sample attempting to make a fair average of the total dump value. A grab sample.

Sample E, a grab sample on the Barcroft dump, a sample of fines on the same dump.

Sample F, taken a dump sample of cobbed ore, to show remaining value. This was taken from the Barcroft lode.

Sample G, taken from west side of Barcroft vein about 150 feet west side of shaft, of Barcroft vein about 150 feet west of the eastern exposure, and on the west end of stope shaft ore. This ore was three feet in thickness.

Sample H, taken from a dump on north and south vein as indicated on a map to be prepared, from cut about 12 feet in length, showing vein eight feet in thickness.

No.	Gold value	Silver value	Lead per cent	Total value
1	trace	\$0 18	none	\$0 18
2	\$0 41	9 60	13.52	31 97
3	0 41	20 26	38.37	82 06
4	0 41	12 95	25.44	54 06
5	0 62	49 90	64.11	153 09
6	3 30	14 42	10.72	34 87
7	0 41	37 18	73.02	154 26
8	0 20	1 43	1.65	4 22
9	trace	5 04	11.22	23 01
10	2 48	1 12	none	3 60

¹ Bradley, Walter W., The Minarets District, Madera County, Mining in California, October, 1926. State Mineralogist's Report, XXII, pp. 539-557.

A	\$ 0 20	\$3 95	22.68 copper	-----
B	1 65	3 79	15.68	\$30 52
C	7 85	20 29	60.95	125 66
D	3 10	22 11	70.72	138 38
E	0 20	12 23	45.88	85 83
F	3 10	9 51	28.75	58 61
G	3 72	18 37	57.20	113 61
H	0 08	2 52	4.80	10 84

I have calculated the percentages of lead at .8 cents per pound. Have eliminated the copper sample in estimates, as this was a sample of small importance; desired to test for gold and copper. The average values are near \$65.21 per ton.

Burris Lead Claims. F. P. Burris, Rt. A, Box 145, Fresno, owns two claims adjoining those of Bliss and Barcroft. There is a 12-foot vein of galena ore assaying 95 oz. silver and up to \$6 in gold per ton.

Galena King Group (Bruce Group). Owner, H. M. Bliss, of North Fork. Situated on the northwest slope of Mt. Lyell at the extreme north end of the Ritter Range. Elevation, 10,000 feet; the claims being above timber line.

There is now a Forest Service road to Clover Meadows, from which the claims are reached by a 12-mile trail.

One vein, traceable for about 1500 feet on the surface, strikes east-west. Another north-south vein, traceable for about the same distance, crosses it. There is no timber, the surface being barren rock. Porphyry, diorite, basalt and limestone comprise the country rock. A large part of the lower portion of the property is covered with slide rock.

An incline shaft has been sunk on the vein on Bruce No. 1 Claim, said to be 35 feet deep, but partly filled with water. The vein is reported strong at the bottom. It is visible for several feet below the water level. About 50 tons of ore have been taken from a vertical shaft on Bruce No. 2 Claim, from which assays showing as high as 80% lead and 114 oz. silver a ton are said to have been obtained. There is some copper and a trace of gold also.

Water is present in abundance, the North Fork flowing across some of the claims. Within one-half mile there are two falls, one with 200-foot and one with a 600-foot drop. Timber is encountered about two miles below the property. Owing to the high altitude, it is probable that the open or working season will not exceed six months.

Johnson Group. There was considerable activity at the Johnson Group during the summer of 1928, it being reported that 30 men were employed in building a good auto truck road from Mammoth to the mine, a distance of 12 miles. One car of lead-silver-copper ore, stated to have a value of \$60 a ton, has been shipped and it is expected that regular shipments will commence in the spring. Supplies have been taken in for winter work, and the main shaft will be sunk from the 100-ft. level to 400 feet.

Mingus, Anderson and Williams Claims include several groups covering deposits of molybdenum, copper-silver ore and iron in the Minarets. Only a little work of a superficial nature has been done to date, but it is expected that during the summer of 1929 work will be resumed and possibly include drilling of a large body of magnetite to determine its extent.

Nidever Group. D. C. Nidever reports that open cuts on the north claims have exposed a very large tonnage of mixed zinc-copper-lead-

silver ore, the mineralized zone being 75 feet in width at this place. On the south, on the Tal Vez claim, an open crosscut and shallow shaft in a large limestone dike expose lead-silver ore over a width of about 150 feet. The entire ore-bearing zone at this point is about 600 feet in width; exposures being made on two claims which parallel each other.

Bibl: State Mineralogist's Report XXII, pp. 539-557.

IRON

There has been little change in the status of the Minarets Iron deposits. The *Noble Electric Steel Company*; W. H. French, receiver, Russ Building, San Francisco, owns two patented claims and eight unpatented claims on the deposit commonly known as the 'Minarets Iron Deposit,'¹ at Iron Mountain between the Middle and North Forks of San Joaquin River.

The deposits at Iron Mountain have been described in an earlier report of the State Mining Bureau² and were not included in Bradley's Report³ of 1926, nor was this district visited by the writer. The deposits were recently examined by Ellsworth Y. Dougherty, whose report⁴ was published in the Engineering and Mining Journal, and from which the following excerpts have been taken:

"These deposits are in the headwater drainage area of the North and Middle forks of the San Joaquin River—a region of rugged grandeur and striking rock sculpture, with deeply dissected canyons, numerous snow-fed streams and glacier-carved lakes. Looking north from the main orebody the Minarets Mountains, a portion of the Ritter range, rise in a series of serrate peaks to an elevation in excess of 12,000 ft. above sea level. Iron Mountain, so-called, though this peak is not iron-ore bearing, overlooks and adjoins the magnetite mineralized area. It is the most southerly of the Ritter range. Its geographical and geological setting will be emphasized by noting that Yosemite Valley is about 25 miles on an air line west-northwest of Iron Mountain and in the same geological province.

"Travel to the Iron Mountain area is best made over the Mammoth Trail. This trail connects Mammoth Lakes, in the high Sierras of Mono County, with an automobile road to Bass Lake, and thence through the west foothills of the Sierra Nevada Mountains to the San Joaquin Valley.

* * * * *

"In this ice- and snow-ridden region there is little obscuring vegetation, soil, or oxidized surface mantle above about 9000 to 9500 ft. elevation (average timber line). It is possible, therefore, to obtain a comprehensive understanding of the geology even without a detailed examination of many interesting and important details. The magnetite deposits are in the bare-rock horizon above timber line, and their exposures are consequently easily traced in most occurrences.

"The outstanding geological feature of the Iron Mountain area is a zone of metamorphic rocks with the longer horizontal axis striking in a general northwest direction, penetrated, truncated, embayed, and in part segmented by plutonic intrusions. In general the metamorphic rocks occupy the higher ridges and peaks, and the intrusives the slopes and depressions. The metamorphics appear to be mostly of igneous origin, and in large part of basic composition. Some fine-grained intercalations may be metamorphosed sedimentaries, and some of the metamorphics are of acid igneous derivation. The typical metamorphics are closely joined or slaty. Some formations are true schists. I do not know the age of the metamorphics other than the fact that they are older than the intrusive rocks.

"These intrusives are a portion of the granodiorite batholith which forms the core of the Sierra Nevada Mountains and has a wide areal extent. This batholith is commonly ascribed to late Jurassic or early Cretaceous time. The exposed intrusive rocks in the contiguous area northwest, west, southwest and south of Iron Mountain embrace the zone of magnetite mineralization. It shows pronounced differentiation, varying from basic to ultra acid. The various differentiations may merge into the main igneous body or they may sharply cut this parent mass; or the differentiations may merge into one another, or sharply cross one another. Even where sharp, many contacts are physically inseparable and mineralogically blended. Some differentiations, however, such as aplite, pegmatite, and quartz dikes, are discrete physical units, penetrating either or both the parent igneous body and the metamorphics. In the nature of their contact relations one can not see important differences between many of the irregular differentiations and some metallic aggregations, nor between

¹ Weeks, F. B., The Minaret iron deposit: State Mineralogist's Report XIV, pp. 555-558, 1914.

² op. cit.

³ Dougherty, Ellsworth Y., Magnetite Deposits of Madera County, California, Constitute Important Reserves. Engineering and Mining Journal, Vol. 123, No. 19, May 7, 1927, pp. 765-770.

the dikes and some mineral veins conceivably formed under similar circumstances. The ideas so frequently and forcibly emphasized by Spurr, that magmatically derived ore veins have been emplaced in essentially the same way as ordinary igneous dikes, and that these ore veins are an offspring of igneous differentiation, surely gain ground (at least for ore veins of deep-seated origin) by examination of such an area as that in the vicinity of Iron Mountain. As far as I could see the observed igneous differentiations give no evidence that they have thrust aside their containing walls. It must be admitted, however, that in the case of these Iron Mountain igneous differentiations, as well as in many cases of veins, it is conceivable that a spreading of the containing walls may have occurred without leaving its imprint. The evidence is not conclusive either for or opposed to this process.

"The contact of the differentiated plutonic body (which for convenience I shall term 'the granitic rocks,' although on the average these rocks are more basic than granite) with the metamorphics, is characteristically sharp but frequently discordant with the slaty cleavage of the metamorphics, which the intrusives cut at random.

"Both the granitic rocks and the metamorphics are penetrated by basic intrusives. Unlike the differentiations of the granitic rocks, these basic intrusives appear to have originated during a distinctly later stage of solidification than the granitic rocks.

* * * * *

"Magnetite aggregations, disseminations, and vein-like bodies are in a zone which strikes roughly northwest in general parallelism with the main belt of metamorphic rocks and near or in its western contact zone. There is no restriction of magnetite to the granitic-metamorphic contacts, but the general areal distribution of the magnetite conforms to the area of penetration and segmentation of the metamorphics by the granitic rocks. Magnetite is in both the granitic and metamorphic rocks. The largest bodies are in the cleavable metamorphic rocks, and it is apparent that this rock type is more favorable for widespread and concentrated magnetite deposition than the granitic rocks. In these metamorphics the magnetite forms irregular disseminations or massive aggregations without limiting fissure walls and apparently without fissure control. Some inclusions of metamorphic rock, within the granitic rocks, have been almost entirely converted into near-ore by thorough disseminations of magnetite, and the surrounding granitic rocks contain but a sparse mineralization. Magnetite in the granitic rocks typically forms veinlets and sparse disseminations. In some cases the granitic rocks contain small massive magnetite bodies, but in no observed instance are there extensive deposits as in the cleavable metamorphics. Important though it be to a full understanding of magnetite genesis, I regret that I have not sufficient data to establish the age of the basic intrusives. They may be post-mineral or nearly contemporaneous with magnetite deposition.

"Of the several mineralized loci in the area, only one is of sufficient size and grade to be worthy of consideration as an orebody. This iron orebody has a striking exposure on a precipitous cliff forming the northeast side of the ridge extending northwest from Iron Mountain peak. All of the exposed mass above the snow is iron ore, and much of it is nearly solid magnetite. The length of the exposure is about 500 ft.

* * * * *

"The orebody passes into the granitic rocks on both sides of its horizontal extension, so that the statement previously made that the magnetite bodies lie in both the granitic and metamorphic rocks holds. The relative hospitality of the slaty metamorphics and the blocky granitic rocks for ore is shown by the fact that a large mass of ore in the metamorphics narrows and finally peters out in veinlets and sparse disseminations in the granitic rocks.

* * * * *

"Published reports of possible tonnages, which include such statements as 'practically unlimited supply,' 'largest in the West,' and '30 million tons practically in sight,' are apparently optimistic generalization, rather than measured estimates. In my judgment the only deposit in the area examined combining sufficient size and grade to constitute an orebody, under present economic conditions, is the main deposit. This orebody is exposed through a horizon of about 550 ft. (but not in a vertical line from top to bottom), and for a horizontal distance of about 1400 ft. Estimating the mass of ore actually exposed along the strike and the cliff section, which cuts the strike diagonally through the widths measured on the surface, and to maximum depths somewhat below visible ore along the sides of the body, a figure in the neighborhood of a million tons virtually 'in sight' is obtained. Considering the ore to descend throughout its length to the lowest depth visible, which is its most northwesterly outcrop, and to maintain its width shown at the outcrop throughout its depth, rough measurements indicate ore around seven million to ten million tons. Variations depend upon width measurements, which are at present indefinite because of float mantling of ore in place, and also upon the configuration given the lower assumed limit of ore, upon which there is much uncertainty. An assumption of considerable vertical continuity below present exposed lower limits raises the reserve of ore well above the largest figure mentioned. The topography permits easy and rapid testing of the grade and vertical continuity of the ore by a series of bore holes.

"Many million of tons can be removed through one or more tunnels before sinking would become necessary. Direct attack by open cuts and removal of several million tons is possible with no preliminary development work whatever. No waste overburden is present. More favorable conditions for cheap mining of the surface or near-surface ore would be difficult to find. These factors help to offset the most adverse factor to be met in exploiting the deposit—namely, the long snow season. Even in early July of some years snow covers portions of the outcrop and surrounding slopes. As open-cut work would be the most economical mining method until considerable depth below the apex of the deposit had been reached, the long snow season would increase mining costs.

"The nearest railroad connection to Pacific Coast consuming centers is near Bass Lake, in the west foothills of the Sierra Nevada, an air-line distance of about 30 miles, and a drop in elevation from about 10,500 ft. at the mine to about 3500 ft.

near Bass Lake. The first 3000 to 4000 ft. of drop can readily be accomplished by an aerial tram. The cost of constructing a railroad to make the ore available at the Pacific Coast must of course be carefully considered. Elaboration of this problem will not be attempted. Based on present ore 'in sight,' railroad construction cost to Bass Lake or the vicinity will be excessive, and not justified. A necessary preliminary is a thorough testing of the grade and quantity of ore. Favorable factors are the relative cheapness with which this testing can be accomplished and the very moderate preliminary development expense necessary to mine many millions of tons of ore. * * *

Other claims in this area are held by S. M. Mingus, et al., of Coalinga, on which development work is expected to be done during the coming year.

Bibl: State Mineralogist's Report XIV, pp. 555-558. Engineering and Mining Journal Vol. 123, No. 19, May 7, 1927, pp. 765-770.

MAGNESITE

Magnesite is reported to occur in veins up to three feet in width one-quarter mile south of the old town of Grub Gulch. Some claims were located on it by R. E. Hawkes, but they have been allowed to lapse. This deposit was not visited.

MARBLE (See Dolomite and Limestone)

MINERAL WATER

There are several soda and sulphur water springs, both cold and hot, near Isberg Pass and the Devil's Post Pile in the extreme eastern end of the county. They are not utilized, however, except by occasional camping parties. Of the hot springs, the most important are the 'Red Meadows Hot Sulphur Springs' at the Devil's Post Pile; temperatures 90° to 120° F.

Bibl: U. S. G. S. Water Supply Paper No. 338, pp. 55, 238, 239, 240, 241, 381.

MOLYBDENITE

A deposit of molybdenite was found near Sugar Pine and some development work done on it, but it proved to be of small size. It was said to contain a little gold. Molybdenite also occurs in the Minarets District.

NICKEL AND COBALT

Wm. Krone of Coarsegold has 80 acres under an agricultural patent in Secs. 23 and 26, T. 10 S., R. 19 E., 12 miles northeast of Madera. The foothill copper belt formations make a sharp bend here and a large body of talcose schist is developed. While prospecting this for copper, a body of pyrrhotite ore was opened up which is reported to assay 7% nickel and 14% cobalt. There has been no commercial production.

Bibl: State Mineralogist's Report XIV, p. 559.

PETROLEUM

Wildeat drilling for oil is being carried on by the Fort Wayne-Madera Syndicate in Sec. 22, T. 10 S., R. 17 E. Indications are said to be encouraging.

SILICA (Quartz)

Several occurrences of massive white vein quartz are known. These are associated with the copper belt in the foothill area, and are similar to those farther north in Mariposa County.

Buchanan Property. A large outcrop of white quartz occurs on this property in the Daulton district, within a mile of the Berenda-Raymond branch of the Southern Pacific Railroad. Undeveloped. Address, Alex Erickson, Box 207, Madera.

SOAPSTONE

A deposit of talcose schist on the north side of San Joaquin River a short distance above Friant has been known for many years, but not utilized except locally. The belt of material is about 400 feet wide. It is not high grade but can be sawed into blocks several feet across.

Bibl: State Mineralogist's Report XIV, p. 559.

STONE INDUSTRY

(Crushed rock, sand and gravel)

There is no commercial rock-crushing plant in the county, but large quantities of sand and gravel have been taken from the beds of Cottonwood creek and other streams in the past, particularly by the Santa Fe Railroad. Such sand and gravel has been utilized as 'bank run' material. There is one plant producing washed and screened sand.

Coast Rock and Gravel Co. (Solo Pit.) This sand pit was opened up in 1922. It is situated at Solo Spur on the Santa Fe Railroad where it crosses Cottonwood creek, five miles southeast of Madera. Owner, Coast Rock and Gravel Company, 1000 Hunter-Dulin Building, San Francisco; Emery Oliver, president; F. W. Erlin, vice president and general manager.

A spur track runs to the washing plant, which is operated by electric power supplied by the San Joaquin Light and Power Company. A total of 85 horsepower is required. Two men can operate the plant under normal conditions. A slack-lime scraper digs the material and delivers it to the plant, where the coarse gravel is screened out and rejected, and any clay or very fine sand washed out, leaving a clean product running from 10- to 80-mesh in size. Water is obtained from a well.

The deposit is in the bed of Cottonwood creek (dry) and consists of an upper stratum of so-called 'ditch' sand, six to eight feet thick, underlain by approximately 30 feet of red 'Solo Sand' with clay below. Production has been light recently; the plant having been idle since August, 1928.

TUNGSTEN

Wolframite occurs in the form of masses and large crystals in a quartz vein in andalusite schist, 12 miles north of Raymond. The deposit is undeveloped.

Bibl: Bull. 91, p. 255.

VOLCANIC ASH

Wagner Ranch Deposit. This deposit is on the Ed. Wagner ranch in Sec. 6, T. 11 S., R. 21 E., about one mile from Friant bridge on the road to O'Neals. It was discovered in September, 1927, and consists of a horizontal bed of smooth, soft, pulverulent, cream to gray-colored volcanic ash. The country is rolling and there is considerable overburden. It has been developed by tunnel 200 feet long, run in on the bed from a small gully. The owners estimate the bed to be from 20 to 25 feet deep over 160 acres.

The deposit was taken under lease by the *Airolite Company of America*; Jas. J. Cude, president, Los Angeles. Production was started in April, 1928. The material, which is claimed to have superior virtues as an admixture in concrete, was used mostly in experimental work as operations ceased in July.

There is a small drier and grinding mill, consisting of an improvised rotary tube with oil burner, pulverizer and cyclone separator, all driven by a tractor engine. Two to six men were employed. The lease has recently been renewed, and production is expected to start again within a short time.

Armstrong Ranch Deposit. A similar deposit occurs on the C. D. Armstrong ranch in Sec. 1, T. 11 S., R. 20 E., two miles northwest of Friant. This was first worked in a small way about 25 years ago, it being used for a polish. In 1914 it was leased to the *Mineralite Manufacturing Company*, which had a small plant in Fresno, where the material was crushed and bolted through a 125-mesh screen and used in making a polishing powder and scouring soap. Not active for years

Bibl: State Mineralogist's Report XIV, p. 568.

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LOS ANGELES FIELD DIVISION

W. BURLING TUCKER, Mining Engineer.

On account of unfinished field work there is no report from the Los Angeles Field Division in this issue.

OIL FIELD DEVELOPMENT OPERATIONS

By R. D. Bush, State Oil and Gas Supervisor

From July 1, 1928, to and including September 30, 1928, the following new wells were reported as ready to drill:

Company	Sec.	Twp.	Range	Well No.	Field
ALAMEDA COUNTY:					
Foster & Hammill	21	3	3	2	
FRESNO COUNTY:					
Bullion Mining Co.	20	19	15	1	Coalinga
KERN COUNTY:					
Berry Oil Co.	30	28	21	88	Belridge
Berry Oil Co.	30	28	21	94	Belridge
Berry Oil Co.	30	28	21	228	Belridge
The Ohio Oil Co.	30	28	21	16	Belridge
The Ohio Oil Co.	30	28	21	17	Belridge
The Ohio Oil Co.	30	28	21	18	Belridge
The Ohio Oil Co.	30	28	21	19	Belridge
Union Oil Co.	30	28	21	King 1	Belridge
Union Oil Co.	30	28	21	King 2	Belridge
Union Oil Co.	30	28	21	King 3	Belridge
Standard Oil Co.	18	29	28	Kern Co. Lease No. 5	Kern River
The Ohio Oil Co.	8	30	22		McKittrick
Hugh Porter	26	29	21	1	McKittrick
Honolulu Consolidated Oil Co.	8	32	24	14	Midway
Honolulu Consolidated Oil Co.	8	32	24	16	Midway
Honolulu Consolidated Oil Co.	8	32	24	25	Midway
Honolulu Consolidated Oil Co.	8	32	24	26	Midway
Honolulu Consolidated Oil Co.	8	32	24	27	Midway
North American Oil Consolidated	16	32	23	7-A	Midway
North American Oil Consolidated	32	31	24	31	Midway
North American Oil Consolidated	30	31	24	46	Midway
Richfield Oil Co.	6	32	23	11	Midway
Standard Oil Co.	7	32	24	28	Midway
Standard Oil Co.	29	31	24	53	Midway
Standard Oil Co.	7	32	24	62	Midway
Standard Oil Co.	29	31	24	82	Midway
Standard Oil Co.	33	31	24	91	Midway
Union Oil Co.	27	32	23	W. P. 1	Midway
Berry Holding Co.	11	27	28	Logan 1	Mt. Poso
General Petroleum Corp.	21	27	28	Glide 21	Mt. Poso
General Petroleum Corp.	16	27	28	Heisen 10	Mt. Poso
R. S. Lytle	26	27	28	2	Mt. Poso
Petroleum Securities Co.	21	27	28	Glide 2	Mt. Poso
Petroleum Securities Co.	21	27	28	Glide 3	Mt. Poso
Petroleum Securities Co.	15	27	28	Glide-Vedder 1	Mt. Poso
Petroleum Securities Co.	22	27	28	King 1	Mt. Poso
Petroleum Securities Co.	22	27	28	King 2	Mt. Poso
Petroleum Securities Co.	22	27	28	Reuch 2	Mt. Poso
Petroleum Securities Co.	22	27	28	Reuch 3	Mt. Poso
Shell Co.	16	27	28	Security 3	Mt. Poso
Signal Gasoline Co., Inc.	27	27	28	3	Mt. Poso
Signal Gasoline Co., Inc.	27	27	28	4	Mt. Poso
Lindsay Oil Co.	6	28	29	1	Round Mountain
The Reynolds Oil & Gas Co.	6	28	29	1	
Fred M. Sayre	10	28	28	Sayre-McNeil 2	Round Mountain
Shell Co.	29	28	29	Jewett 4	Round Mountain
Northern Oil Co.	1	11	23	15	Sunset
Standard Oil Co.	27	11	20	Kern Co. Lease No. 2	Wheeler Ridge
S. A. Delzel	4	26	27		
Elk Horn Oil Co.	20	28	20	1	
Famosa Oil Co.	34	27	26	Mattei 1	
General Petroleum Corp.	32	29	29	Kerwin 32	5
Alfred L. Marsten	27	29	27	1	

OIL FIELD DEVELOPMENT OPERATIONS—Continued

Company	Sec.	Twp.	Range	Well No.	Field
KERN COUNTY—Continued.					
Milham Exploration Co.	6	28	23	Page 1	
Milham Exploration Co.	27	28	23	Wisnom 1	
P. R. & W. Co.	14	29	27	1	
Pacific Coast Oil Co.	15	29	25	Rio Bravo 1	
The Pacific Eastern Production Co.	6	30	28	4-KCL-A	
The Pacific Eastern Production Co.	22	29	27	4-KCL-B	
The Pacific Eastern Production Co.	22	29	27	5-KCL-B	
The Pacific Eastern Production Co.	5	30	28	Hughes Comm. 1	
The Pacific Eastern Production Co.	21	29	27	Lahore 1	
Richfield Oil Co.	9	2	10	Didier 1	
Standard Oil Co.	35	11	22	Kern Co. Lease No. 6 1	
KINGS COUNTY:					
C. C. Friend	12	23	19	1	
LOS ANGELES COUNTY:					
Union Oil Co.	33	3	13	Callender 25	Dominguez
Standard Oil Co.	17	2	14	L. A. Invest. 1 57	Inglewood
Aitken Oil Co.	24	4	13	2	Long Beach
Bolsa Chica Oil Co.	30	4	12	Combs 2-A	Long Beach
Robert Bowles Oil Co.	24	4	13	4	Long Beach
Cannon-Jones Oil Co.	29	4	12	Hall-Weber 1-A	Long Beach
Tom J. Cannon	29	4	12	Harriman Jones 3	Long Beach
Chicksan Oil Co.	24	4	13	B-R 1-A	Long Beach
Chicksan Oil Co.	24	4	13	Clark 2	Long Beach
Cypress Petroleum Co.	29	4	12	Crest 5	Long Beach
Dabney-Johnson Oil Corp.	19	4	12	12	Long Beach
Dabney-Johnson Oil Corp.	24	4	13	16	Long Beach
Dabney-Johnson Oil Corp.	24	4	13	17	Long Beach
Dabney-Johnson Oil Corp.	24	4	13	18	Long Beach
Dabney-Johnson Oil Corp.	30	4	12	19	Long Beach
Dabney-Johnson Oil Corp.	24	4	13	20	Long Beach
Dabney-Johnson Oil Corp.	24	4	13	21	Long Beach
Dabney-Johnson Oil Corp.	24	4	13	22	Long Beach
D'Angelo Oil Co.	19	4	12	4	Long Beach
Delaney Petroleum Corp.	24	4	13	Bauter-Community 1	Long Beach
Delaney Petroleum Corp.	24	4	13	Irwin 1	Long Beach
Delaney Petroleum Corp.	19	4	12	Wellington 1	Long Beach
Delaney Petroleum Corp.	19	4	12	Wellington 2	Long Beach
Fred F. Fitch and Walter T. Ball	19	4	12	1	Long Beach
General Petroleum Corp.	30	4	12	Boyer-Kelly 6-B	Long Beach
General Petroleum Corp.	30	4	12	Boyle-Perry 8	Long Beach
General Petroleum Corp.	24	4	13	Fulton-McKee 1	Long Beach
General Petroleum Corp.	24	4	13	Kirschner 1	Long Beach
General Petroleum Corp.	13	4	13	Ransome 1	Long Beach
Graham-Loftus Oil Corp.	19	4	12	Bank 1	Long Beach
Graham-Loftus Oil Corp.	24	4	13	Warburten 1	Long Beach
Hancock Oil Co.	19	4	12	Signal 12	Long Beach
Hancock Oil Co.	29	4	12	Signal 14	Long Beach
Hoyt & Wilson	19	4	12	1	Long Beach
Interstate Oil Corp.	29	4	12	Jones 2	Long Beach
A. T. Jergins Syndicate	30	4	12	4	Long Beach
A. T. Jergins Syndicate	24	4	13	5	Long Beach
A. T. Jergins Trust	19	4	12	24	Long Beach
A. T. Jergins Trust	19	4	12	25	Long Beach
M. C. M. Oil Syndicate	19	4	12	1	Long Beach
Miley Oil Co.	19	4	12	Mills 8-A	Long Beach
Modoc Petroleum Corp.	24	4	13	Modoc L. B. 6	Long Beach
Painted Hills Oil Co.	29	4	12	T-1	Long Beach
The Petroleum Co.	24	4	13	Beck 3	Long Beach
The Petroleum Co.	24	4	13	Beck 4	Long Beach
The Petroleum Co.	24	4	13	Island 2	Long Beach
The Petroleum Co.	24	4	13	Hawkeye 2	Long Beach
Plymouth Oil Co.	24	4	13	Plymouth 4	Long Beach
Richfield Oil Co.	29	4	12	Booth 12	Long Beach
Richfield Oil Co.	28	4	12	Booth 14	Long Beach
Richfield Oil Co.	28	4	12	Booth 15	Long Beach

OIL FIELD DEVELOPMENT OPERATIONS—Continued

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Cont.					
Richfield Oil Co.	19	4	12	Butler 1	Long Beach
Richfield Oil Co.	24	4	13	Duncan 3	Long Beach
Richfield Oil Co.	29	4	12	Green 7	Long Beach
Richfield Oil Co.	29	4	12	Lekas 4	Long Beach
Richfield Oil Co.	19	4	12	Malcolm-Davis 4	Long Beach
Richfield Oil Co.	19	4	12	Meder 2	Long Beach
Richfield Oil Co.	19	4	12	Simplex 3	Long Beach
Richfield Oil Co.	24	4	13	West Coast 2	Long Beach
Rio Grande Oil Co.	28	4	12	B-11	Long Beach
Shell Co.	29	4	12	Alamitos 35	Long Beach
Shell Co.	28	4	12	Alamitos 36	Long Beach
Shell Co.	29	4	12	Babb & Tucker 5	Long Beach
Snell Co.	29	4	12	Coseboom 9	Long Beach
Shell Co.	19	4	12	Cresson Comm. 13	Long Beach
Shell Co.	30	4	12	Dobyns 7	Long Beach
Shell Co.	30	4	12	Dobyns 8	Long Beach
Shell Co.	29	4	12	Hutton Community 10	Long Beach
Shell Co.	29	4	12	Jones Comm. 10	Long Beach
Shell Co.	29	4	12	Jones Comm. 11	Long Beach
Shell Co.	19	4	12	Marcellus 6	Long Beach
Shell Co.	29	4	12	Martin Comm. 6	Long Beach
Shell Co.	29	4	12	Nessa 10	Long Beach
Shell Co.	29	4	12	Patton-Wilson 8	Long Beach
Shell Co.	29	4	12	Pickler 9	Long Beach
Shell Co.	29	4	12	Pickler 10	Long Beach
Shell Co.	29	4	12	10-A	Long Beach
Shell Co.	29	4	12	Rose 2	Long Beach
Shell Co.	29	4	12	Shell Fee Land 5	Long Beach
Shell Co.	29	4	12	Stakemiller 6	Long Beach
Shell Co.	29	4	12	Wilbur Comm. 5	Long Beach
Shell Co.	29	4	12	Wilbur Comm. 6	Long Beach
Signal Syndicate No. 4	19	4	12	5-A	Long Beach
Signal Syndicate No. 5	29	4	12	10	Long Beach
Charles A. Son	19	4	12	10	Long Beach
South Basin Oil Co.	30	4	12	Nakamura 1	Long Beach
Southern California Drilling Co.	29	4	12	Miller 1	Long Beach
Superior Oil Co.	24	4	13	Lloyd 1	Long Beach
The Texas Co.	19	4	12	Harlow 12	Long Beach
Turner-Harris Oil Corp.	24	4	13	3	Long Beach
Union Oil Co.	24	4	13	Mills 1	Long Beach
Universal Consolidated Oil Co.	19	4	12	Dell 3	Long Beach
Western Oil & Refining Co. and Olympic Refining Co.	19	4	12	Barham 2	Long Beach
Western Oil & Refining Co. and Olympic Refining Co.	29	4	12	Rogers 3	Long Beach
Standard Oil Co.	2	2	12	Stockert-Merced 2	Montebello
Standard Oil Co.	3	2	12	Whitehead Comm. 3	Montebello
Associated Oil Co.	34	2	14	Cypress 3	Potrero
John B. Harding	17	3	13	1	Rosecrans
Ambassador Petroleum Co.	5	3	11	S. F. 12	Sante Fe Springs
Ambassador Petroleum Co.	5	3	11	S. F. 13	Sante Fe Springs
Associated Oil Co.	31	2	11	Dellugge 7	Sante Fe Springs
Associated Oil Co.	6	3	11	Dewenter 6	Sante Fe Springs
Associated Oil Co.	6	3	11	Dewenter 6	Sante Fe Springs
Associated Oil Co.	6	3	11	Fulton 3	Sante Fe Springs
Associated Oil Co.	6	3	11	Green 3	Sante Fe Springs
Associated Oil Co.	6	3	11	Jordan 2	Sante Fe Springs
Associated Oil Co.	6	3	11	Jordan 3	Sante Fe Springs
Bandini Petroleum Co.	5	3	11	Off 8	Sante Fe Springs
Bandini Petroleum Co.	5	3	11	Off 9	Sante Fe Springs
Barnhart-Morrow Consolidated	6	3	11	Barnhart-Morrow Cons. 16	Sante Fe Springs
W. J. Barnhart	6	3	11	Barnhart 1	Sante Fe Springs
Bell View Oil Syndicate	6	3	11	Grohs 2	Sante Fe Springs
California Eastern Oil Co.	6	3	11	Sante Fe 2	Sante Fe Springs
Cypress Petroleum Co.	6	3	11	Wardman 1	Sante Fe Springs

OIL FIELD DEVELOPMENT OPERATIONS—Continued

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Cont.					
L. T. Edwards	8	3	11	Meyer 1	Sante Fe Springs
General Petroleum Corp.	5	3	11	Anderson 153-C	Sante Fe Springs
General Petroleum Corp.	6	3	11	E. G. B. 101-B	Sante Fe Springs
General Petroleum Corp.	6	3	11	Hill 187-B	Sante Fe Springs
General Petroleum Corp.	6	3	11	Hill-Midway 103	Sante Fe Springs
General Petroleum Corp.	6	3	11	Jalk 111	Sante Fe Springs
General Petroleum Corp.	6	3	11	Jalk 112	Sante Fe Springs
General Petroleum Corp.	6	3	11	Jalk 113	Sante Fe Springs
General Petroleum Corp.	6	3	11	Jalk 114	Sante Fe Springs
General Petroleum Corp.	5	3	11	Sante Fe 145-B	Sante Fe Springs
General Petroleum Corp.	5	3	11	Sante Fe 152-D	Sante Fe Springs
General Petroleum Corp.	5	3	11	Sante Fe 152-E	Sante Fe Springs
General Petroleum Corp.	5	3	11	Sante Fe 160-A	Sante Fe Springs
General Petroleum Corp.	5	3	11	Sante Fe 161-A	Sante Fe Springs
General Petroleum Corp.	5	3	11	Sante Fe 168-B	Sante Fe Springs
General Petroleum Corp.	5	3	11	Sante Fe 168-C	Sante Fe Springs
General Petroleum Corp.	6	3	11	Sante Fe 186-F	Sante Fe Springs
General Petroleum Corp.	6	3	11	Sante Fe 189-C	Sante Fe Springs
General Petroleum Corp.	6	3	11	Sante Fe 189-D	Sante Fe Springs
General Petroleum Corp.	6	3	11	Sante Fe 190-C	Sante Fe Springs
General Petroleum Corp.	6	3	11	Sante Fe 190-D	Sante Fe Springs
General Petroleum Corp.	5	3	11	Sante Fe 204	Sante Fe Springs
General Petroleum Corp.	5	3	11	Sante Fe 208	Sante Fe Springs
General Petroleum Corp.	5	3	11	Sante Fe 209	Sante Fe Springs
General Petroleum Corp.	5	3	11	Sante Fe 225	Sante Fe Springs
General Petroleum Corp.	5	3	11	Sante Fe 226	Sante Fe Springs
General Petroleum Corp.	5	3	11	Sante Fe 227	Sante Fe Springs
General Petroleum Corp.	5	3	11	Sante Fe 228	Sante Fe Springs
General Petroleum Corp.	5	3	11	Sante Fe 229	Sante Fe Springs
General Petroleum Corp.	6	3	11	Sante Fe Comm. 177-C	Sante Fe Springs
General Petroleum Corp.	6	3	11	Sante Fe Comm. 178-A	Sante Fe Springs
General Petroleum Corp.	6	3	11	Sante Fe Comm. 178-B	Sante Fe Springs
General Petroleum Corp.	6	3	11	Sante Fe Comm. 179-D	Sante Fe Springs
General Petroleum Corp.	6	3	11	Sante Fe Comm. 179-E	Sante Fe Springs
General Petroleum Corp.	6	3	11	Sante Fe Comm. 185-B	Sante Fe Springs
General Petroleum Corp.	6	3	11	Sante Fe Comm. 186-D	Santa Fe Springs
General Petroleum Corp.	6	3	11	Sante Fe Comm. 186-E	Sante Fe Springs
General Petroleum Corp.	6	3	11	Sante Fe Comm. 191-B	Sante Fe Springs
General Petroleum Corp.	6	3	11	Sante Fe Comm. 191-C	Santa Fe Springs
George F. Getty, Inc.	6	3	11	S. F. S. 18	Sante Fe Springs
George F. Getty, Inc.	6	3	11	S. F. S. 19	Sante Fe Springs
George F. Getty, Inc.	5	3	11	S. F. S. 20	Sante Fe Springs
George F. Getty, Inc.	6	3	11	S. F. S. 21	Sante Fe Springs
George F. Getty, Inc.	6	3	11	S. F. S. 22	Santa Fe Springs
George F. Getty, Inc.	6	3	11	S. F. S. 23	Santa Fe Springs
George F. Getty, Inc.	6	3	11	S. F. S. 24	Santa Fe Springs
George F. Getty, Inc.	6	3	11	S. F. S. 25	Santa Fe Springs
Graham-Loftus Oil Co.	6	3	11	Sante Fe 1	Santa Fe Springs
Graham-Loftus Oil Co.	6	3	11	Santa Fe 2	Santa Fe Springs
Oscar R. Howard	6	3	11	Hathaway 6	Santa Fe Springs
Jameson Petroleum Co.	6	3	11	10	Santa Fe Springs
C. C. Julian	6	3	11	14	Santa Fe Springs
C. C. Julian	6	3	11	15	Santa Fe Springs
Herbert R. Macmillan	6	3	11	Ratliff 1	Santa Fe Springs
Herbert R. Macmillan	6	3	11	Ratliff 2	Santa Fe Springs
McKeon Drilling Co., Inc.	6	3	11	York-Lockhart 1	Santa Fe Springs
McKeon Drilling Co.	6	3	11	York-Lockhart 2	Santa Fe Springs
Richfield Oil Co.	1	3	12	Elliott 2	Santa Fe Springs

OIL FIELD DEVELOPMENT OPERATIONS—Continued

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Cont.					
Richfield Oil Co.	6	3	11	G. P. 1	Santa Fe Springs
Richfield Oil Co.	5	3	11	Howard 1	Santa Fe Springs
Richfield Oil Co.	5	3	11	Howard 2	Santa Fe Springs
Richfield Oil Co.	6	3	11	Industrial 1	Santa Fe Springs
Richfield Oil Co.	6	3	11	Petifils 1	Santa Fe Springs
Richfield Oil Co.	6	3	11	Wardman 1	Santa Fe Springs
George W. Ring	6	3	11	1	Santa Fe Springs
Rio Grande Oil Co.	6	3	11	Community 1	Santa Fe Springs
J. H. Roth	36	2	12	Roth 1	Santa Fe Springs
Second Twin Bell Syndicate	6	3	11	4	Santa Fe Springs
Shell Co.	6	3	11	G. H. N. 13	Santa Fe Springs
Shell Co.	31	2	11	G. H. N. 14	Santa Fe Springs
Shell Co.	31	2	11	G. H. N. 15	Santa Fe Springs
Shell Co.	31	2	11	G. H. N. 16	Santa Fe Springs
Shell Co.	6	3	11	Slusher 13	Santa Fe Springs
Shell Co.	6	3	11	Slusher 14	Santa Fe Springs
Shell Co.	6	3	11	Slusher 15	Santa Fe Springs
Shell Co.	6	3	11	Slusher B-1	Santa Fe Springs
The St. Helens Petroleum Co., Ltd.	6	3	11	Hill 1	Santa Fe Springs
Standard Oil Co.	31	2	11	Hepler 6	Santa Fe Springs
Standard Oil Co.	6	3	11	Johnson 6	Santa Fe Springs
Standard Oil Co.	6	3	11	Jordan 7	Santa Fe Springs
Standard Oil Co.	6	3	11	Jordan 8	Santa Fe Springs
Standard Oil Co.	6	3	11	Koontz 7	Santa Fe Springs
Standard Oil Co.	6	3	11	Koontz 8	Santa Fe Springs
Standard Oil Co.	6	3	11	Koontz 9	Santa Fe Springs
Standard Oil Co.	6	3	11	Koontz 10	Santa Fe Springs
Standard Oil Co.	6	3	11	Koontz 11	Santa Fe Springs
Standard Oil Co.	31	2	11	Santa Ger-trudes 11	Santa Fe Springs
Standard Oil Co.	6	3	11	Walker Comm. 11	Santa Fe Springs
Standard Oil Co.	6	3	11	Walker Comm. 12	Santa Fe Springs
Standard Oil Co.	6	3	11	Walker Comm. 14	Santa Fe Springs
Standard Oil Co.	6	3	11	Walker Comm. 15	Santa Fe Springs
Standard Oil Co.	6	3	11	Walker Comm. 16	Santa Fe Springs
Standard Oil Co.	6	3	11	Walker Comm. 17	Santa Fe Springs
Standard Oil Co.	6	3	11	Walker Comm. 18	Santa Fe Springs
Standard Oil Co.	6	3	11	Weisel 13	Santa Fe Springs
Standard Oil Co.	6	3	11	Weisel 15	Santa Fe Springs
Standard Oil Co.	6	3	11	Weisel 16	Santa Fe Springs
Standard Oil Co.	6	3	11	Weisel 17	Santa Fe Springs
Superior Oil Co.	6	3	11	Wardman 4	Santa Fe Springs
Superior Oil Co.	6	3	11	Wardman 5	Santa Fe Springs
The Texas Co.	6	3	11	Baldwin 3	Santa Fe Springs
The Texas Co.	6	3	11	Batson 5	Santa Fe Springs
The Texas Co.	6	3	11	Fox 4	Santa Fe Springs
The Texas Co.	6	3	11	Fox 5	Santa Fe Springs
The Texas Co.	6	3	11	Fox 6	Santa Fe Springs
The Texas Co.	6	3	11	Matern Three 10	Santa Fe Springs
The Texas Co.	6	3	11	Matern Three 11	Santa Fe Springs
The Texas Co.	6	3	11	Matern Three 12	Santa Fe Springs
The Texas Co.	6	3	11	Matern Three 13	Santa Fe Springs
The Texas Co.	6	3	11	Matern Three 14	Santa Fe Springs
The Texas Co.	6	3	11	Patterson 10	Santa Fe Springs
The Texas Co.	6	3	11	Patterson 11	Santa Fe Springs
The Texas Co.	6	3	11	Patterson 12	Santa Fe Springs
The Texas Co.	6	3	11	Standlee 4	Santa Fe Springs
The Texas Co.	6	3	11	Steinly 4	Santa Fe Springs
The Texas Co.	6	3	11	Steinly 5	Santa Fe Springs
The Texas Co.	6	3	11	Steinly 6	Santa Fe Springs
The Texas Co.	6	3	11	Weaver 4	Santa Fe Springs
The Texas Co.	6	3	11	Weaver 5	Santa Fe Springs
The Texas Co.	6	3	11	Weaver 6	Santa Fe Springs
The Texas Co.	5	3	11	Wickman 3	Santa Fe Springs
Union Oil Co.	6	3	11	Alexander 10	Santa Fe Springs
Union Oil Co.	6	3	11	Alexander 11	Santa Fe Springs
Union Oil Co.	6	3	11	Alexander 12	Santa Fe Springs

OIL FIELD DEVELOPMENT OPERATIONS—Continued.

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Cont.					
Union Oil Co.	6	3	11	Alexander 13	Santa Fe Springs
Union Oil Co.	6	3	11	Alexander 14	Santa Fe Springs
Union Oil Co.	6	3	11	Alexander 15	Santa Fe Springs
Union Oil Co.	6	3	11	Alexander 16	Santa Fe Springs
Union Oil Co.	6	3	11	Bell 30	Santa Fe Springs
Union Oil Co.	6	3	11	Bell 31	Santa Fe Springs
Union Oil Co.	6	3	11	Bell 32	Santa Fe Springs
Union Oil Co.	6	3	11	Bell 33	Santa Fe Springs
Union Oil Co.	6	3	11	Bell 34	Santa Fe Springs
Union Oil Co.	6	3	11	Bell 35	Santa Fe Springs
Union Oil Co.	6	3	11	Bell 36	Santa Fe Springs
Union Oil Co.	6	3	11	Bell 37	Santa Fe Springs
Union Oil Co.	6	3	11	Bell 38	Santa Fe Springs
Union Oil Co.	6	3	11	Bell 39	Santa Fe Springs
Union Oil Co.	31	2	11	Howard 9	Santa Fe Springs
Union Oil Co.	31	2	11	Howard 10	Santa Fe Springs
Union Oil Co.	31	2	11	Howard 11	Santa Fe Springs
Universal Consolidated Oil Co.	6	3	11	Blanchard 6	Santa Fe Springs
Universal Consolidated Oil Co.	6	3	11	Blanchard 7	Santa Fe Springs
Universal Consolidated Oil Co.	6	3	11	Blanchard 8	Santa Fe Springs
Universal Consolidated Oil Co.	6	3	11	Blanchard 9	Santa Fe Springs
Universal Consolidated Oil Co.	5	3	11	O'Connell 3	Santa Fe Springs
Wilshire Annex Oil Co.	6	3	11	Wilshire Annex-Koontz 2	Santa Fe Springs
Wilshire Annex Oil Co.	6	3	11	Wilshire Annex-Koontz 3	Santa Fe Springs
Wilshire Annex Oil Co.	6	3	11	Wilshire Annex-Koontz 4	Santa Fe Springs
Wilshire Annex Oil Co.	6	3	11	Wilshire Annex-Koontz 5	Santa Fe Springs
Wilshire Oil Co., Inc.	6	3	11	Wilshire-Baker 4	Santa Fe Springs
Wilshire Oil Co., Inc.	6	3	11	Wilshire-Baker 5	Santa Fe Springs
Wilshire Oil Co., Inc.	6	3	11	Wilshire-Baker 6	Santa Fe Springs
Wilshire Oil Co., Inc.	6	3	11	Wilshire-Cecelia 1-B	Santa Fe Springs
Wilshire Oil Co., Inc.	6	3	11	Wilshire-Crawford 1-A	Santa Fe Springs
Wilshire Oil Co., Inc.	6	3	11	Wilshire Petersen 1-A	Santa Fe Springs
Wilshire Oil Co., Inc.	6	3	11	Wilshire Petersen 2-A	Santa Fe Springs
Marland Oil Co.	3	5	12	Bixby 22	Seal Beach
Marland Oil Co.	11	5	12	Bixby 23	Seal Beach
Marland Oil Co.	2	5	12	Bixby 24	Seal Beach
Marland Oil Co.	11	5	12	Bixby 25	Seal Beach
Standard Oil Co.	3	5	12	San Gabriel 15	Seal Beach
Standard Oil Co.	11	5	12	San Gabriel 17	Seal Beach
C. C. M. O. Co.	15	4	14	Torrance 82	Torrance
Associated Oil Co.	33	2	12	Taylor 1	-----
Empire Drilling Co.	14	2	12	Gaffey 1	-----
Pomona Oil Assn.	32	1	8	Community 1	-----
Smith Petroleum Co.	20	3	14	Peck 1	-----
D. H. Wood	13	7	10	2	-----
ORANGE COUNTY:					
Brea Canon Oil Co.	1	3	10	45	Brea-Olinda
Union Oil Co.	23	3	10	Hole 19	Coyote Hills
F. E. Bundy	11	6	11	Camp Ground 1	Huntington Beach
P. Campbell	10	6	11	Campbell 2	Huntington Beach
Commonwealth Oil Co.	10	6	11	4	Huntington Beach
E. A. Fennell Co., Inc.	10	6	11	3	Huntington Beach
Sam N. Lewis	10	6	11	Ivan 1	Huntington Beach
C. A. Lundberg	10	6	11	2	Huntington Beach
W. D. McKoy	11	6	11	2	Huntington Beach
Cheater Moore	10	6	11	Community 1	Huntington Beach
Rex Oil Co.	35	5	11	9	Huntington Beach
Sextette Oil Co.	10	6	11	1	Huntington Beach
Standard Oil Co.	34	5	11	Bolsa 39	Huntington Beach

OIL FIELD DEVELOPMENT OPERATIONS—Continued.

Company	Sec.	Twp.	Range	Well No.	Field
ORANGE COUNTY—Continued.					
Standard Oil Co.	34	5	11	Bolsa 40	Huntington Beach
Standard Oil Co.	34	5	11	Huntington B 61	Huntington Beach
Standard Oil Co.	12	6	11	Thomson 9	Huntington Beach
Union Oil Co.	34	5	11	Copeland 23	Huntington Beach
Western Drilling & Producing Co.	10	6	11	24	Huntington Beach
Continental Oil Co.	33	3	9	Richfield Comm.	
Continental Oil Co.	33	3	9	Winann 1	Richfield
O'Brien & Webber	28	3	9	1	Richfield
Rawco Oil Co.	33	3	9	1	Richfield
Superior Oil Co.	33	3	9	Pyne 1	Richfield
Union Oil Co.	33	3	9	Mullin 1	Richfield
Continental Oil Co.	10	3	11	McNally 1	
SAN LUIS OBISPO COUNTY:					
A. T. Jergins Trust	31	31	13	McNee 3-A	Arroyo Grande
San Luis Syndicate	31	31	13	2	Arroyo Grande
Dollar Oil Co.	13	32	22	Phelps 1	
SANTA BARBARA COUNTY:					
Palmer Union Oil Co.	30	9	32	Stendel 17	Cat Canyon
Winann Oil Co.	30	9	32	2	Cat Canyon
Barnsdall Oil Co.		4	29	Elwood Comm. 1	Elwood
Barnsdall Oil Co.	15	4	29	Luton-Bell 2	Elwood
Dunlap & Dunlap		4	29	Orphan 1	Elwood
Bankline Oil Co.		4	29	Archambeault-Doty 1	Goleta
SANTA CLARA COUNTY:					
H. W. Covert	8	9	1	6	Moody Gulch
VENTURA COUNTY:					
R. E. Burke, Trustee	11	4	23	1	Ojai
Rancho Riva Oil Co.	28	4	23	8	Ojai
Temescal Petroleum Co.	3	4	18	Temescal 5	Piru
General Petroleum Corp.	8	3	21	Hobson A-3	Rincon
Willis W. Bryant	21	4	21	3	Santa Paula
White Star Oil Co.	33	5	19	21	Sespe
Oak Ridge Oil Co.	13	3	21	Harvey 23	South Mountain
Associated Oil Co.	23	3	23	McGonigle 6	Ventura
Associated Oil Co.	28	3	23	S. P. Foster 3	Ventura
Associated Oil Co.	28	3	23	S. P. Percy 1	Ventura
Associated Oil Co.	28	3	23	S. P. Percy 2	Ventura
General Petroleum Corp.	28	3	23	Notten 12	Ventura
M. K. & T. Oil Co.	28	3	23	Foster 2	Ventura
Petroleum Securities Co.	28	3	23	Orton 11	Ventura
Petroleum Securities Co.	28	3	23	Orton 12	Ventura
Petroleum Securities Co.	28	3	23	Orton 13	Ventura
Petroleum Securities Co.	28	3	23	Willett 4	Ventura
Petroleum Securities Co.	28	3	23	Willett 5	Ventura
Shell Co.	28	3	23	Gosnell 29	Ventura
Shell Co.	28	3	23	Gosnell 30	Ventura
Shell Co.	28	3	23	Taylor 28	Ventura
Shell Co.	28	3	23	Taylor 29	Ventura
Shell Co.	28	3	23	Taylor 30	Ventura
Shell Co.	28	3	23	Taylor 31	Ventura
Shell Co.	35	2	22	Diedrich 1	
Standard Oil Co.	15	2	22	Saticoy-Citrus 5	

SPECIAL ARTICLES

Detailed technical reports on special subjects, the result of research work or extended field investigations, will continue to be issued as separate bulletins by the Bureau, as has been the custom in the past.

Shorter and less elaborate technical papers and articles by members of the staff and others are published in each number of *MINING IN CALIFORNIA*.

These special articles cover a wide range of subjects both of historical and current interest; descriptions of new processes, or metallurgical and industrial plants, new mineral occurrences, and interesting geological formations, as well as articles intended to supply practical and timely information on the problems of the prospector and miner, such as the texts of new laws and official regulations and notices affecting the mineral industry.



BIENNIAL REPORT OF THE STATE MINERALOGIST

*To His Excellency HONORABLE C. C. YOUNG,
Governor of California.*

Sir: Herein I have the honor to present the biennial report of the state mineralogist as required by law (Stats. 1913, Chap. 679), covering the work and activities of the State Mining Bureau (now Division of Mines and Mining of the Department of Natural Resources, since August 29, 1927), for the period of July 1, 1926, to June 30, 1928.

The period covered was actually wholly within the regime of my predecessor, Mr. Lloyd L. Root, whom I succeeded on August 1, 1928; but having been his deputy during that time, I should be in a position to give at least a summary of the work accomplished.

In the course of its forty-eight years of existence the State Mining Bureau has rendered service of incalculable value to the state and nation, more than compensating many times over for the small sums expended upon it. It has attained to a world-wide reputation among mining men, and its plan has been copied in a number of other states and countries.

California, with an area of 158,297 square miles and divided into fifty-eight counties, has mineral deposits of both present and potential value in every one of those fifty-eight subdivisions. During the calendar year, 1926, there was reported commercial production of fifty-six different mineral substances, having a total value in the crude state of \$450,330,856. Though in 1927 there was a drop in total value to \$366,659,594 owing to lower prices prevailing for petroleum (even with a considerable increase in quantity output), there was a substantial growth in volume and value of the substances making up the non-metallic groups of structural, industrial, and salines materials. In fact, throughout the country, but especially on the Pacific Coast, the most important advances economically are being made in the utilization of non-metallic minerals. New deposits are being found, new uses are being developed for minerals already known, and in some instances uses are being developed for minerals hitherto thought to be worthless from an economic standpoint. There is not another equal area on the face of the earth that can surpass California's record for diversity; in fact few, if any, can equal it. This will give some faint hint of our possibilities for future developments.

The State Division of Mines and Mining is the one state agency established in California to make surveys of our mineral wealth and to maintain and promulgate the necessary vital data for the benefit of the consuming and investing public. As already stated above, the Bureau's record of accomplishment and the actual commercial additions to the state's wealth resulting therefrom during the past forty-eight years of its history has more than justified the small expenditure for its maintenance, in fact entitle this division to far more generous support than it has usually had in the past.

In the language of the statute, it is the duty of the state mineralogist to

"make, facilitate and encourage, special studies of the mineral resources and mineral industries of the state. It shall be his duty: to collect statistics concerning the occurrence and production of the economically important minerals and the methods pursued in making their valuable constituents available for commercial use; to make a collection of typical geological and mineralogical specimens, especially those of economic and commercial importance, such collection constituting the museum of the state mining bureau; to provide a library of books, reports, drawings, bearing upon the mineral industries, and sciences of mineralogy and geology, and arts of mining and metallurgy, such library constituting the library of the state mining bureau; to make a collection of models, drawings and descriptions of the mechanical appliances used in mining and metallurgical processes; to preserve and so maintain such collections and library as to make them available for reference and examination, and open to public inspection at reasonable hours; to maintain, in effect, a bureau of information concerning the mineral industries of this state, to consist of such collections and library, and to arrange, classify, catalogue, and index the data therein contained in a manner to make the information available to those desiring it; to issue from time to time such bulletins as he may deem advisable concerning the statistics and technology of the mineral industries of this state."

ORGANIZATION AND ACTIVITIES

Mining Division.

Both general and specific data relative to the mines, quarries, mineral springs, and oil wells of every county in the state are, with few exceptions, available for the information of the public. To keep this authentic, up-to-date, and usable requires constant checking up both by correspondence and field trips. So far as possible, the bureau acts as a clearing house between producers of ores and minerals and the buyers or consumers of these materials. Authoritative information is given out in answer to both personal and written inquiries relative to every phase of the mining industry, and by distributing maps and bulletins showing results of field investigations completed and progress made in determining the extent and value of our mineral resources; also the ways in which they can be utilized to best advantage with maximum efficiency.

Prospectors, mining engineers, stockholders in mining companies, and many others daily call upon the staff of this division in search of information covering points of mining law, location of particular mineral deposits, markets for various mineral substances, and for geological and geographical data too diversified to attempt to enumerate here.

One of the important duties of the division is the collecting annually of complete and authentic data on the commercial production and value of the output of all mines, quarries, smelters, mineral springs, etc., which are compiled and published each year. These statistical reports present concrete evidence of the actual commercial results obtained from the exploitation and development of California's varied and widespread mineral resources. The laboratory classifies and identifies mineral specimens forwarded by prospectors and other citizens of this state who require this assistance. This service encourages the search for minerals and gives the sender definitely positive or negative information relative to the value or possibilities of his find, without cost or

fee. A negative report may be just as valuable as a positive one, because many times it forestalls the expenditure of further time, money and energy on a worthless material. The mineral exhibit in the Ferry Building possesses an exceptionally fine collection of rocks and minerals of both economic and academic value. It ranks among the more important of such collections in North America, and contains not only specimens of most of the known minerals found in California, but much valuable and interesting material from other states and foreign countries as well. Besides its practical use in the economic development of California's mineral resources, the collection is a most valuable educational asset to the state. It is of interest to note that other than two similar but possibly smaller collections in Denver, Colorado, this exhibit of California's is the only large public mineral collection in the United States which is located in a distinctly mining state, the most important ones being in New York City, Washington, D. C., Chicago, and Cambridge (Harvard University).

Oil Department.

The 'Department of Petroleum and Gas' functions under a separate and specific statute (Stats. 1921, Chap. 912), but under the jurisdiction of the state mineralogist. It is concerned with the conservation of the oil and gas resources of California, and particularly with protective measures against damage by water. Since the formation of the State Department of Natural Resources much of the administrative work of the oil division has been handled direct between the oil and gas supervisor and the director of the department. Routine supervision of the development of the state's oil fields has proceeded without event of unusual note during the past two years. The state oil and gas supervisor is cooperating in the move, initiated for natural gas conservation, by your Excellency in the appointment of the special Gas Conservation Board.

It is a recognized fact among oil operators that through the work of this department of the State Division of Mines and Mining and the growth of its organization caring for the petroleum and gas industry, there has been developed a specific branch of engineering practice which has been invaluable to oil development and conservation. Several instances could be cited of men trained in the department having been called to other states as well as to foreign countries in order to take advantage of this engineering and technical progress.

Publications.

The publications of the State Mining Bureau are grouped as follows:

State Mineralogist's Reports, which cover in detail the mines and mineral resources taken by districts and counties. In 1922, issuance of these was begun in the form of monthly installments or 'advance chapters' under title of *Mining in California*. After the March, 1923, number the period was changed to quarterly.

Bulletins, on specific minerals or ores, or on special subjects relating to mining, metallurgy, or allied branches.

Preliminary Reports, as the name implies, are preliminary or incomplete reports on some subject for which there is an immediate demand for data and on which a full report is anticipated later in bulletin form.

Several of these were issued during the period of the World War, dealing with certain of the 'war minerals.'

Monthly Summaries of California's Oil Field Operations, being advance chapters of the annual reports of the State Oil and Gas Supervisor.

Oil Field Maps. Blue-line prints of maps of all of the important oil fields in the state. These are frequently revised so that they are kept up to date as developments progress.

Commercial Mineral.

Notes—issued monthly (mimeographed).

Publications issued, July 1, 1926-June 30, 1928—

July and October chapters of State Mineralogist's Report XXII, 1926. Among the more important subjects included were:

Mineral Resources of Marin, Sonoma, El Dorado and Inyo counties.

Special articles on: "Gas, Gasoline and Petroleum" (being judicial interpretations and definitions); "Copper in California"; "The Minarets District, Madera County."

State Mineralogist's Report XXIII (1927), containing:

Mineral Resources of Contra Costa, Amador, Solano, Placer, Los Angeles and Mono counties, and Santa Catalina Island.

Special articles on: "Report of Hydraulic Mining Commission"; "Bibliography of Clay Deposits in California"; "Ore Buyers License Act"; "Department of Natural Resources Act."

January and April chapter of State Mineralogist's Report XXIV (1928), containing:

Mineral Resources of Tuolumne and Mariposa counties.

Bulletin No. 97. California Mineral Production for 1925 by Walter W. Bradley, 172 pages, 19 illustrations.

Gives detailed production figures for all fuels, metals, structural materials, industrial materials, and salines produced in California, the data being compiled from direct returns from the operators in answer to inquiries sent out by the Bureau. In addition to figures of output, there are included descriptions of the uses and characteristics of many of the materials, as well as a brief mention of their occurrence.

Bulletin No. 99. The Clay Resources and the Ceramic Industry of California, by Waldemar Fenn Dietrich, Associate Professor of Mining Engineering, Stanford University, 383 pages, 70 half-tone cuts, 12 plates and maps.

This bulletin gives the results of a study of the raw materials and manufacturing practice, including a brief technical description of most of the clay-working plants and known clay deposits in California, together with the results of laboratory tests of the important clays of the state. The principal emphasis in this report is upon the economic and technologic phases of the clay-working industry of California, rather than upon its geologic aspects. The report is the result of over two years' field and laboratory investigations by Professor Dietrich, the latter having been carried on in the engineering laboratory of Stanford University on a cooperative basis with the State Division of Mines and Mining.

Bulletin No. 100. California Mineral Production for 1926, by Walter W. Bradley, 175 pages, 14 illustrations.

Gives the detailed figures of commercial production of all mineral substances in California for the calendar year 1926.

Monthly Summary of California's Oil Field Operations, July, 1926, to June, 1927, inclusive, being chapters of the Twelfth Annual Report of the State Oil and Gas Supervisor. Containing also the following special articles:

Report on the northeastern flank of the Buena Vista Hills, Midway Oil Field, Kern County.

Production statistics of California oil fields.

Directory of California oil operators.

Use of heavy minerals in rotary drilling mud in the Ventura Field.

Dominguez Oil Field.

Production losses into low-pressure oil and gas sands.

The Richfield Oil Field.

Report on the Mt. Poso Oil Field.

Wilcat wells abandoned in 1925 and 1926.

Conservation of gas in the production of oil.

Fossil markers of Midway-Sunset-Elk Hills in Kern County.

Development of the Maricopa shale production in the southeastern portions of Thirty-five Anticline, Sunset Oil Field, Kern County.

Recent developments in the Huntington Beach Oil Field.

Monthly Summary of California's Oil Field Operations, July, 1927-March, 1928, inclusive, being chapters of the Thirteenth Annual Report of the State Oil and Gas Supervisor. Containing also the following special articles:

Some improvements in fishing tools and devices used in rotary drilling.

Production statistics of California oil fields.

Directory of California oil operators.

Seal Beach Oil Field.

Loss of production due to improper completion method.

Landing and cementing long water strings.

Production records and methods of measuring fluid.

Report on the Kern Front area of the Kern River Oil Field, Kern County.

Wilcat wells abandoned in 1927.

How to increase oil recovery and conserve gas in the field.

Present Outlook and Needs of This Division.

Although much has been accomplished in the past by this division and its predecessor, the State Mining Bureau, toward the upbuilding and development of California's mineral resources, there is yet a great deal more that awaits to be done and that requires such assistance as only a state agency of this character can render. Such commercial developments as result from these activities means increased taxable property values often of some millions of dollars annually. As pointed out in a preceding paragraph, the Bureau's record of accomplishment

and the actual commercial additions to the state's wealth resulting therefrom, entitle the division to more generous financial support than it has usually had in the past.

Two years ago an increase of approximately 20 per cent in appropriation was granted this division for the current biennium (the 79th and 80th fiscal years). In the budget request being submitted to the Department of Finance for the 80th and 81st biennium, our estimates are based on a further increase in approximately a like amount. If approved, as we trust it will be, the total will still be below the appropriation given the bureau in the 73d-74th biennium, because of the very severe cut made for the 75th and 76th years.

We expect that before the close of the current fiscal year our organization will be able to complete the general minerals resources survey of the entire state by county units. This was begun in January, 1925, and to keep pace with economic developments should have been completed in two years. California is a large state with varied and widespread resources. With the limited personnel and funds of the division, it is taking four years to cover the ground.

As before stated, the most important advances economically in recent years in California and on the Pacific Coast are being made in the utilization of the nonmetallic minerals—those ores or materials mined for purposes other than the extraction of their metal contents. There is a present urgent demand for accurate, authoritative, and up-to-date information, and in published form, on these resources. This division has just recently made available for distribution a report on the clay resources and the ceramic industry of California, as the culmination of two years' field work and laboratory work, the latter conducted in cooperation with Stanford University. This is already meeting a vital need, and much favorable comment has resulted therefrom. We propose to extend this character of work to surveys of the other substances comprising the structural and industrial materials groups.

As the foundation for such mineral surveys as above noted, there should years ago have been prepared an accurate and detailed geological map of the state, such as was contemplated by the earlier 'geological surveys,' the predecessors in the 50's and 60's of the State Mining Bureau, and such as is contemplated by the United States Geological Survey but only in part as yet accomplished. The practical, economic developmental features of the bureau's functions should continue unabated, but there is ever present this need for a fundamental geological survey of the earth's surface and its constituent formations. This is not a piece of work which can be consummated in a single year or even in a biennium, but a start should be made. Our universities will cooperate, through their geological departments. Our budget request for the coming biennium includes provision for the beginning of such a fundamental survey.

Printing. An increased allotment for printing the bulletins and other reports of this division is urgently needed. This is no new situation in the State Mining Bureau. There have been many cases in its past history, where the publication of a valuable and timely report was so long delayed or it was so emasculated by deletion, because of insufficient funds to pay the printer, that its effectiveness and practical value were largely lost. This, too, after several thousands of dollars (in one

case at least fifteen thousand) had been spent on the field investigations and the preparation of the report.

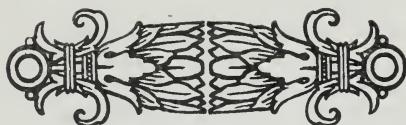
Conclusion.

In conclusion, may I again say that the State Division of Mines and Mining and its predecessor, the State Mining Bureau, have accomplished much of practical value in the economic upbuilding of California's mineral industries and in making known her extensive and varied resources; and that there is yet even more that can be accomplished in the coming years, provided only that sufficient support be granted the department by the people and their legislative representatives.

Respectfully submitted.

WALTER W. BRADLEY,
State Mineralogist.

San Francisco, September 15, 1928.



ADMINISTRATIVE DIVISION

WALTER W. BRADLEY, State Mineralogist

Personnel.

Mr. Sam P. Senior, Jr., has been appointed a 'junior mining engineer' on the staff of this division and assigned to duty as librarian, vice Mr. E. A. Lowe, resigned.

New Publications.

During the quarterly period covered by this issue, the following publications of the Division of Mines and Mining have been made available for distribution:

Mining in California (quarterly), July, 1928, being Chapter 3 of State Mineralogist's Report XXIV. Price 25 cents. It contains reports on the Mineral Resources of Butte and Tehama counties, and a special article on the mining laws of the United States and California.

Summary of Operations, California Oil Fields, Vol. 13, Nos. 8, 9 and 10, February, March, April, 1928, respectively. These contain articles on: "Production Statistics for 1927," "How to Increase Oil Recovery and Conserve Gas in the Field," and "Variables of Natural Gas Production and Utilization in California."

Commercial Mineral Notes, Nos. 65 and 66, August and September, 1928, respectively. These "notes" contain the lists of "mineral deposits wanted" and "minerals for sale" issued in the form of a mimeographed sheet, monthly. It is mailed free to those on the mailing list for MINING IN CALIFORNIA.

Mails and Files.

The Division of Mines maintains, in addition to its correspondence files and the library, a mine file which includes original reports on the various mines and mineral properties of all kinds in California.

During each quarterly period there are several thousand letters received and answered at the San Francisco office alone, covering almost every phase of prospecting, mining and developing mineral deposits, reduction problems, marketing of refined products, and mining law. In addition to this, hundreds of oral questions are answered daily, both at the main office and the district offices, for the many inquirers who come in for personal interviews and to consult the files and library.



DIVISION OF MINERALS AND STATISTICS

Statistics, Museum, Laboratory

HENRY H. SYMONS, Statistician and Curator

STATISTICS.

Data on the 1927 production of some of California's minerals were given in both the April and July issues of *Mining in California* and tabulations are presented herein showing the completed totals for all substances for that year grouped by substances and by counties. The complete detailed annual report on mineral production of California for 1927 is now in press, as Bulletin No. 101 of the State Division of Mines and Mining.

Summary for 1927.

The total value of the mineral output of California for the year 1927 was \$366,661,394, being a decrease of \$83,669,462 under the 1926 total of \$450,330,856. There were fifty-eight different mineral substances, exclusive of a segregation of the various stones grouped under gems; and all of the fifty-eight counties of the state contributed to the list.

As revealed by the data following, the salient features of 1927 compared with the preceding year were: A large drop in the value of petroleum in an amount greater than the net decrease in the grand total for all substances, being only partly offset by increases in other items. Material advances were made by borates, cement, potash, natural gas, granite, limestone, quicksilver, sandstone, and soda. Decreases were registered by copper, zinc, miscellaneous stone, brick, lead, salt, and silver. Petroleum showed a decrease in value of \$84,811,179, although there was an increase from 224,637,281 barrels to 231,195,774 barrels. This was due to a sharp cut in the price of crude oil, mainly grades over 20° Baumé, effective April 16, 1927. There were a number of other minor variations, the result being a decrease in the totals of the fuels and metals groups, while all other groups showed increases.

Of the metals, titanium was added to the list, being the first year of any record of its production in commercial quantity in California; quicksilver increased from 5892 flasks worth \$516,382 to 6488 flasks worth \$714,418, this being accounted for by the advanced price received by the producers. In 1926 they received \$87.64 and in 1927 \$116.94 per 75-pound flask. Copper decreased from 33,521,544 pounds worth \$4,693,014 to 27,350,316 pounds worth \$3,582,885; gold from \$11,923.481 to \$11,671,018; lead from 8,067,873 pounds worth \$645,429 to 2,748,440 pounds worth \$173,151; silver from 2,022,460 fine ounces worth \$1,262,015 to 1,620,242 fine ounces worth \$918,677; and zinc from 20,447,559 pounds worth \$1,533,568 to 8,625,004 pounds worth \$552,000. The decrease in copper, lead and zinc was due to a drop in the market prices, while the gold and silver, by-products in these ores, account for the decreases in the total gold and silver figures. Though the gold yield decreased in value, California continues in the lead and in 1927 accounted for approximately 26 per cent of the gold output of the United States.

Of the structural group: Cement advanced from 13,797,173 barrels valued at \$25,269,678 to 14,661,783 barrels at \$26,474,935, though the average price per barrel dropped from \$1.84 to \$1.80; granite increased

in value from \$655,332 to \$1,398,443, and sandstone from \$17,500 to \$205,400; brick and hollow building tile dropped from a valuation of \$7,026,124 to \$6,516,077, and miscellaneous stone from \$19,859,873 to \$18,912,994; of the remaining minerals in this group there were no material changes. Of the industrial minerals there were a number of fluctuations, with a general trend of increasing production and value. The important changes were: pottery clay with an increase from 797,-461 tons valued at \$806,509 to 867,419 tons and \$872,661; limestone from 108,795 tons valued at \$367,501 to 899,790 tons and \$663,957. Of the saline group, borates showed an increase from 47,605 tons valued at \$1,625,298 to 72,482 tons at \$3,043,260; potash, 32,884 tons valued at \$812,285 to 67,340 tons and \$1,952,852; and salt showed a decrease from 311,761 tons valued at \$1,124,978 to 263,028 tons and \$639,127.

The distribution of the 1927 output of California by substances is shown in the following tabulation:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Barytes	17,993 tons	\$90,617
Bituminous rock	3,515 tons	17,704
Borates	72,462 tons	3,043,260
Brick and hollow building tile	-----	6,516,077
Cement	14,661,783 bbls.	26,474,935
Chromite	225 tons	5,063
Clay (pottery)	867,419 tons	872,661
Copper	27,350,316 lbs.	3,582,885
Dolomite	45,976 tons	79,422
Feldspar	10,932 tons	86,101
Fuller's earth	13,018 tons	154,764
Gems	-----	7,035
Gold	-----	11,671,018
Granite	-----	1,398,443
Gypsum	94,630 tons	292,090
Lead	2,748,440 lbs.	173,151
Lime	60,498 tons	631,497
Limestone	699,790 tons	663,957
Magnesite	46,093 tons	577,887
Mineral water	16,644,423 gals.	1,487,183
Natural gas	224,686,940 M cu. ft.	20,447,294
Onyx and travertine	18,135 cu. ft.	29,500
Petroleum	231,195,774 bbls.	260,735,498
Platinum	139 fine oz.	10,749
Potash	67,340 tons	1,952,852
Pumice and volcanic ash	7,779 tons	48,896
Pyrites	130,910 tons	564,823
Quicksilver	6,488 flasks	714,418
Salt	263,028 tons	639,127
Sandstone	22,900 cu. ft.	205,400
Silica (sand and quartz)	24,636 tons	94,762
Silver	1,620,242 fine oz.	918,677
Slate	2,686 tons	17,960
Soapstone and talc	16,218 tons	164,744
Soda	62,571 tons	1,478,239
Stone, miscellaneous ^a	-----	18,912,994
Zinc	8,625,004 lbs.	552,000
Unapportioned ^b	-----	1,347,711
Total value	-----	\$366,661,394

^a Includes macadam, ballast, rubble, riprap, sand, gravel, and grinding-mill pebbles.

^b Includes antimony, asbestos, bromine, coal, graphite, diatomaceous earth, iron ore, lithia, magnesium salts, marble, mineral paint, sillimanite-andalusite-cyanite group, titanium and tungsten.

Distribution by counties is given in the following tabulation:

Alameda	\$2,577,787	Placer	360,224
Alpine	5,306	Plumas	3,260,723
Amador	2,207,798	Riverside	6,543,369
Butte	308,139	Sacramento	2,348,916
Calaveras	1,608,714	San Benito	1,901,854
Colusa	13,207	San Bernardino	16,140,703
Contra Costa	2,172,756	San Diego	1,619,431
Del Norte	53,975	San Francisco	62,700
El Dorado	245,435	San Joaquin	711,965
Fresno	7,427,216	San Luis Obispo	295,030
Glenn	63,869	San Mateo	1,863,838
Humboldt	562,802	Santa Barbara	2,699,296
Imperial	350,977	Santa Clara	990,876
Inyo	2,519,834	Santa Cruz	3,473,209
Kern	64,729,483	Shasta	1,950,088
Kings	1,599	Sierra	752,533
Lake	85,048	Siskiyou	298,946
Lassen	49,425	Solano	1,557,840
Los Angeles	131,832,441	Sonoma	265,392
Madera	1,059,666	Stanislaus	393,089
Marin	527,004	Sutter	300
Mariposa	499,878	Tehama	5,350
Mendocino	47,670	Trinity	555,854
Merced	366,873	Tulare	474,173
Modoc	62,251	Tuolumne	432,416
Mono	102,187	Ventura	30,995,379
Monterey	351,049	Yolo	17,895
Napa	417,229	Yuba	3,679,632
Nevada	2,213,709	Total	\$366,661,394
Orange	60,547,041		

MUSEUM

The Museum of the State Mining Bureau possesses an exceptionally fine collection of rocks and minerals of both economic and academic value. It ranks among the first five of such collections in North America; and contains not only specimens of most of the known minerals found in California, but much valuable and interesting material from other states and foreign countries as well.

Mineral specimens suitable for exhibit purposes are solicited, and their donation will be appreciated by the State Mining Bureau as well as by those who utilize the facilities of the collection.

The exhibit is daily visited by engineers, students, business men, and prospectors as well as tourists and mere sightseers. Besides its practical use in the economic development of California's mineral resources, the collection is a most valuable educational asset to the state and to San Francisco.

LABORATORY

FRANK SANBORN, Mineral Technologist

Samples continue to be received at this laboratory at the rate of about thirty a day. Letters which accompany most of these samples usually request that a test be made for a particular mineral. At all times one special mineral appears to predominate in its popularity with the prospector, and this predominance varies or runs in cycles, probably on account of publicity given or on account of an increase in its market value or its consumption. Such minerals as andalusite, chromite, platinum, cinnabar, etc., have had their period of preeminence as the objective of the searchers. During these 'drives' for a particular product more or less of the desired material is frequently brought to light. During the past two months a noticeable increase in the number of requests for gold determinations have been made, which indicates that there is a tendency towards a revival of prospecting for the yellow metal.

Gold has been produced in two-thirds of the counties of California. It practically always exists as the native metal, either as free gold or else mechanically mixed with sulphides, such as iron, lead or copper. Occasionally gold is so intimately mixed with pyrite that it is very difficult to see it readily in the concentrates obtained in panning, or it sometimes occurs in such a finely divided state in quartz that it is invisible. Tellurides of gold occur in California, but so far have been found only in subordinate amounts, and when found, usually enough free gold is present to be readily detected in panning. As a result of the gradual increase in the price of mercury, many of the old quicksilver mines have been reopened and some of these are producing or are about to produce. A market for California chromite will also probably be gradually created on account of the increase in the consumption of chromates due to chrome plating and tanning.



LIBRARY

SAM P. SENIOR, JR., Librarian

In addition to the numerous standard works, authoritative information on many phases of the mining and mineral industry is constantly being issued in the form of reports and bulletins by various government agencies.

The library of the Division of Mines and Mining contains some five thousand selected volumes on mines, mining and allied subjects, and it is also a repository for reports and bulletins of the technical departments of federal and state governments and of educational institutions, both domestic and foreign.

It is not the dearth of the latter publications, but rather a lack of knowledge of just what has been published and where the reports may be consulted or obtained, that embarrasses the ordinary person seeking specific information.

To assist in making the public acquainted with this valuable source of current technical information, *MINING IN CALIFORNIA* contains under this heading a list of all books and official reports and bulletins received, with names of publishers or issuing departments.

Files of all the leading technical journals will be found in the library, and county and state maps, topographical sheets and geological folios. Current copies of local newspapers published in the mining centers of the state are available for reference.

The library and reading room are open to the public during the usual office hours, when the librarian may be freely called upon for all necessary assistance.

OFFICIAL PUBLICATIONS RECEIVED

Governmental.

U. S. Geological Survey:

Professional Papers:

150—Shorter Contributions to General Geology, 1927.

153—Studies of Basin-Range Structure. By Grove Karl Gilbert.

72-73—Denudation and Erosion in the Southern Appalachian District and in the Monongohela River Basin.

Bulletins:

775—Geology and Lignite Resources of the Marmarth Field, Southwestern North Dakota. By C. J. Hares.

788—Topographic Instructions of the United States Geological Survey.

798—Geology of the Muddy Mountains, Nevada. By Chester R. Longwell.

802—Bibliography of North American Geology for 1925, 1926. By John M. Nickels.

Water Supply Papers:

540—Ground Water in the New Haven Area, Connecticut. By John S. Brown.

581—Surface Water Supply of the United States, 1924, Part I. North Atlantic Slope Drainage Basins. By Nathan C. Grover.

590—Surface Water Supply of the United States, 1924, Part X. The Great Basin. By Nathan C. Grover.

596—Contributions to the Hydrology of the United States, 1927. By Nathan C. Grover.

Hawaiian Volcano Observatory: Monthly Bulletins of the, Vol. XV, Nos. 10, 11, 12.

U. S. Coast and Geodetic Survey:

424—Seismological Report, July, August, September, 1926.

U. S. Bureau of Mines:

Technical Papers:

- 423—Cyanide Extraction of Gold and Silver Associated with Arsenic and Antimony in Ores. By Edmund S. Leaver and Jesse A. Woolf.
- 425—Production of High Alumina Slags in the Blast Furnace. By T. L. Joseph, S. P. Kinney, and C. E. Wood.
- 430—Accidents at Metallurgical Works in the United States during the Calendar Year 1926. By William W. Adams.
- 436—The Sulphur Problem in Burning Coal. By J. F. Barkley.

Bulletins:

- 284—Production and Development Problems in the Powell Oil Field, Navarro County, Texas. By H. B. Hill, and Chase E. Sutton.
- 462—Park Recreation Areas in the United States.

Mineral Resources of the United States:

- Preliminary Summary, 1927.
- Fluorspar and Crysolite in 1927.
- Gold, Silver, Copper, Lead and Zinc in Idaho and Washington in 1926.
- Fuel Briquets in 1927.
- Carbon Black Produced from Natural Gas in 1927.
- Gold, Silver, Copper, Lead and Zinc in Utah in 1926.

Reports of Investigations:

- 2879—Active List of Permissible Explosives Approved Prior to June 30, 1928.
 (Contains complete list of permissible explosives as of June 30, 1928. Gives details of classification of permissible explosives on basis of volume of poisonous gases produced and on basis of characteristic ingredients of each explosive.)
- 2880—Crushing and Grinding Studies of Quartz. By John Gross and S. R. Zimmerley.
 (Gives details of a dissolution method for surface measurement of crushed material, which may be applied in determining the results of crushing and grinding quartz.)
- 2881—Review of Fatalities in the California Petroleum Industry during the Calendar Year 1927. By G. B. Shea.
 (Discusses typical cases of fatal accidents occurring in oil fields and at oil refineries and natural gasoline plants, and points out means of prevention.)
- 2882—Shaft Fires—Magma Mine. By E. D. Gardner and D. J. Parker.
 (Contains particulars of fire that occurred at Magma Copper Company mine, Superior, Arizona, November 24, 1927, and presents general conclusions as to prevention of fires in metal mines.)
- 2883—The Retreatment of Comstock Tailings. By E. S. Leaver and J. A. Woolf.
 (Outlines different methods for recovery of mercury and copper from tailings which had been treated by amalgamation process.)
- 2884—Desirable Characteristics of Coke: Chemical. By J. D. Davis.
 (Discusses effects of varying amount of moisture, volatile matter, fixed carbon, sulphur and phosphorus on quality and fuel value of coke, also characteristics of cokes of high and low reactivity.)
- 2885—Standardizing the Open Flow From Natural Gas Wells. By R. R. Brandenthaler, E. L. Rawlins, and T. W. Johnson.
 (Gives details of tests conducted in Chickasha gas field, Oklahoma, to determine possible relationship between open-flow volumes of gas wells taken through well-head nipples of various diameters.)
- 2886—Notable Increase in Fuel Economy Recorded at Petroleum Refineries in 1927. By G. R. Hopkins.
 (Statistical analysis of fuel consumption at oil refineries in the United States.)
- 2887—Eighteenth Semiannual Motor Gasoline Survey. By E. C. Lane, D. B. Taliaferro, Jr., and J. A. Mann.
 (Discusses results of survey of characteristics of motor gasolines marketed in eleven widely scattered cities in the United States.)

Information Circulars.

- 6074—Survey of Cracking Plants, January 1, 1928. By G. R. Hopkins.
 (Statistical summary, containing list of plants for the refining of crude petroleum by the "cracking" process, with data as to location, daily charging capacity and type of process used.)
- 6075—Recent Developments in the Production of Motor Fuels From Coal. By A. C. Fieldner.
 (Discusses possibilities of various methods for producing supplementary supplies of motor fuel from coal; and reviews foreign processes, with special reference to Bergius process.)
- 6076—How Fires Start in Mines. By K. L. Marshall.
 (Enumerates various causes of mine fires as an aid to the study of means of prevention.)
- 6077—List of Permissible Mining Equipment.
 (Gives complete list of permissible mining equipment, rescue apparatus and gas masks, as of July 1, 1928. Includes electric air compressors, coal drills, mining machines, loading machines, conveyors, mine pumps, room hoists, mine telephones, rock-dusting machines, switches, electric cap lamps, flame safety lamps, electric hand and trip lamps, flash lamps, methane indicators and detectors, blasting units, storage battery locomotives, tandem locomotives, power trucks, concrete mixers, self-contained oxygen breathing apparatus and gas masks.)
- 6078—Railroad Fuel Oil Consumption in 1927. By Arthur Huber Redfield.
 (Statistical analysis, including tables showing railroad fuel oil purchases, stocks, and consumption; fuel oil consumed by locomotives by Class I railroads; and comparison of oil with other fuels consumed by Class I railroads.)
- 6079—Notes on the Determination of Molybdenum. By H. A. Doerner.
 (Points out erroneous results often obtained in determination of molybdenum in ores containing vanadium or tungsten, and describes method for correctly estimating molybdenum content of such ores.)
- 6080—Sources and Distribution of Major Petroleum Products Atlantic Coast States—1927. By E. B. Swanson.
 (Statistical analysis of sources and distribution of gasoline, kerosene and other gas oil and fuel oil delivered in this region.)
- 6081—Recovery of Fine Gold by Amalgamation. By Edmund S. Leaver.
 (Brief outline of methods for recovery of float gold, rusty gold, gold contained in pyrite, etc.; includes many bibliographic references.)

Arkansas Geological Survey:

An Outline of the Metallic Minerals of Arkansas, 1928.

California Department of Natural Resources:

Division of Fish and Game.

California Fish and Game, Vol. 14, No. 3.

Florida Geological Survey:

19th Annual Report (1928).

Idaho Bureau of Mines and Geology:

Pamphlet No. 28—Portland Cement Materials near Pocatello, Idaho. By Alfred L. Anderson.

Pamphlet No. 29—Brief Papers of Geologic Field Work in Idaho During 1927. By Virgil R. D. Kirkham.

Pamphlet No. 30—A Geological Reconnaissance in the St. Maries Region, Idaho. By Alfred L. Anderson.

Press Bulletin No. 17—Concerning Land Slides Near Whitebird, Idaho. By Virgil R. D. Kirkham.

Illinois Geological Survey:

Bulletin 55—Geology and Mineral Resources of the Herscher Quadrangle. By L. F. Athy.

Kansas State Geological Survey:

Bulletin 14—Volcanic Ash Resources of Kansas. By Kenneth K. Landes.

Kentucky Geological Survey:

Pamphlet XXI—The Geology and Physiography of the Mammoth Cave National Park. By Armin Kohl Lobeck.

Administrative Report of the Years 1926 and 1927. By Willard Rouse Jillson.
Department of Internal Affairs, Commonwealth of Pennsylvania:

Bulletin M-12—Anthracite Culm and Silt (duplicate).
M- 6—Part I, General Information on Coal.

Virginia Geological Survey:

Bulletin No. 31—Water Resources of Virginia. By J. J. Dirzulaitis and G. C. Stephens.

West Virginia Geological Survey:

County Reports, 1927.
Maps, 1927.

Barcelona, Real Academia de Ciencias y Artes:

Memorias de la, Vol. XX, No. 13—La Sintesis Moderna de las Escencias Combustibles.

No. 14—La Flora de la Duna Barcelonesa de Castelldefels. Boletin de la, Vol V, No. 5.

Buenos Aires Instituto de Geologia y Perforaciones:

Boletin No. 9—Contribucion al conocimiento de las rocas "basalticas" de la formacion de Gondwana en la America del Sud.

No. 10—Condideraciones sobre los Restos de un Elemento Estructural, aun Desconocido del Uruguay y el Brazil mas meridional.

Canada Department of Mines:

Investigations in Ore Dressing and Metallurgy. 1926.

Investigations in Ceramics and Road Materials. 1926.

Investigations of Mineral Resources and the Mining Industry. 1926.

Investigations of Fuels and Fuel Testing. 1926.

Finland Kommissionen Geologiska:

Bulletin 78—Geologische und Petrographische Untersuchungen im Kainuugebiete.

89—Uber Die Spatglazialen Niveauverschie Bungen in Nordkarelein, Finland.

81—On the Development of Lake Hoytieninen in Carelia, and its Ancient Flora.

82—Uber Wiikit.

84—Uber Das Verhaltnis der ose Zum Hochsten Strand.

Great Britain Geological Survey:

Classified Geological Photographs.

The Geology of the Country Around Wrexham, Part II, 1928.

Japan Imperial Geological Survey:

Sheet 220—Explanatory Text of the Geological Map of Japan—Okayama. By Tsuyoshi Akagi.

Sheet 99—Explanatory Text of the Geological Map of Japan—Tsukuba. By Hokoto Sato.

Sheet 98—Explanatory Text of the Geological Map of Japan—Hokota. By Hokoto Sato.

Reports 95, 96, 97.

Leidsche Geologische Mededeelingen—Deel II, Aflevering 4.

London Imperial Institute:

Mercury Ores. By Edward Halse.

Mexico Secretaria de Industria, Comercio y Trabajo:

Boletin del Petroleo, Vol. XXV, No. 4.
Vol. XXV, No. 5.

Boletin Minero, Tomo XXV, Numero 6.

Revista Mensual de las Actividades en Mexico. Hasta el 15 de agosto de 1928.

Ontario Department of Mines:

Bulletin No. 65—Mineral Production of Ontario, First Six Months of 1928.

Ministerstwo Przemyslu I Handlu, Poland. Departament Gorniczo-Hutniczy.
Statistical Data for the Months of March and April, 1928.

Quebec Department of Colonization, Mines, and Fisheries:

Report on Mining Operations in the Province of Quebec during the year 1927.

Queensland Department of Mines:

Annual Report of the Under Secretary for Mines, 1927.

Royal Society of South Australia, Inc.:

Transactions and Proceedings of the, Vol. LI.

Scotland Geological Survey Memoirs:

The Geology of Arran. By G. W. Tyrrell.

Victoria Department of Mines:

Records of the Geological Survey of Victoria, Vol. V, Part I—The Sorrento Bore, Mornington Peninsula. By Frederick Chapman.

Victoria Geological Survey:

Maps.

Wonga Wonga, Alberton West, Yanakie, Yanakie South, Tarwin, Nariel, and part of Burrungabucce and Corryong.

Societies and Educational Institutions.

American Institute of Mining and Metallurgical Engineering:

List of Members of the, Corrected to April 14, 1928.

Technical Publication No. 115—Some Applications of Potential Methods to Structural Studies.

American Petroleum Institute:

First Semi-Annual Meeting of the Division of Development and Production Engineering, June, 1928.

Summary of Reports. June, 1928.

American Philosophical Society:

Proceedings of the, Vol. LXVII, No. 2.

Canadian Institute of Mining and Metallurgy:

Bulletin 196.

Transactions for 1927—Exploration for Ore by Potential Methods—reprint.

Economic Geology:

Vol. XXIII, No. 5, August, 1928.

No. 6, September and October, 1928.

Empire Mining and Metallurgical Congress, Canada:

II—Mining.

III—Petroleum.

IV—Metallurgy of Iron and Steel.

V—Non-Ferrous.

I—General.

Institution of Mining and Metallurgy:

Bulletin No. 287. August, 1928.

Transactions of the, 36th Session, 1926–1927.

Members, Constitution, By Laws and Charter, Sept., 1928.

Official Notices, Sept., 1928.

University of Minnesota:

Mining Director of Minnesota, 1928.

Department of Mineralogy and Petrography of Harvard University:

Petrology of the North Conway Quadrangle in the White Mts. of New Hampshire.

Larsenite and Calcium Larsenite, of the Chrysolite Group, from Franklin Furnace, New Jersey.

A Hydrothermal Origin of Corundum and Albitite Bodies.

Wohlerite and Hjortdahlite from Vesuvius.

Mineralogical Society of America:

The American Mineralogist, Vol. 13, No. 7, No. 9, No. 10.

Philippine Journal of Science:

Vol. 36, No. 1, No. 2.

Western Society of Engineers:

Journal of the, Vol. XXXIII, No. 7, No. 8, No. 9.

Rio de Janeiro Collegio Pedro:

Relatorio Concernente Aos Annos Lectivos de 1925 e 1926.

Riojun College of Engineering:

Memoirs of the, Vol. I, No. 1, No. 2, No. 3.

Strasbourg, Universite de:

Memoires du Service de la Carte Geologique D'Alsace et de Lorraine. No. 2

Books:

The Mineral Industry During 1927.

Maps.

U. S. Topographic:

Kern County California.

Famoso Quadrangle,

Miramonte Ranch Quadrangle,

Pond Quadrangle,

Hamlin School Quadrangle,

McFarland Quadrangle,

Wasco Quadrangle.

Current Magazines on File

For the convenience of persons wishing to consult the technical magazines in the reading room, a list of those on file is appended:

American Petroleum Institute, New York.

Architect and Engineer, San Francisco.

Arizona Mining Journal, Phoenix, Arizona.

Asbestos, Philadelphia, Pennsylvania.

Brick and Clay Record, Chicago.

Bulletin, Union Oil Co., Los Angeles.

California Journal of Development, San Francisco.

Cement, Mill and Quarry, Chicago, Illinois.

Chemical-Engineering and Mining Review, Melbourne, Australia.

Engineering and Mining Journal, New York.

Explosives Engineer, Wilmington, Del.

Financial Insurance News, Los Angeles, California.

Graphite, Jersey City.

Journal of Electricity and Western Industry, San Francisco.

Mine and Quarry, Chicago.

Mining and Engineering Record, Vancouver, B. C.

Mining and Oil Bulletin, Los Angeles.

Oil Age, Los Angeles.

Oil and Gas Journal, Tulsa, Oklahoma.

Oil and Gas News, Kansas City.

Oil News, Galesburg, Illinois.

Oildom, New York.

Oil, Paint and Drug Reporter, New York.

Oil Trade Journal, New York.

Oil Weekly, Houston, Texas.

Petroleum Age, New York.

Petroleum Record, Los Angeles.

Petroleum World, Los Angeles.

Queensland Government Mining Journal, Brisbane, Australia.

Rock Products, Chicago, Illinois.

Safety News, Industrial Accident Commission, San Francisco.
Salt Lake Mining Review, Salt Lake City, Utah.
Southwest Builder and Contractor, Los Angeles.
Standard Oil Bulletin, San Francisco.
Stone, New York.
The Record, Associated Oil Company, San Francisco.
Through the Ages, Baltimore.

Newspapers.

The following papers are received and kept on file in the library:

Amador Dispatch, Jackson, Cal.
Arkansas Oil and Mineral News, Hot Springs National Park (Arkansas).
Barstow Printer, Barstow, Cal.
Blythe Herald, Blythe, Cal.
Bridgeport Chronicle-Union, Bridgeport, Mono Co., Cal
Calaveras Prospect, San Andreas, Cal.
California Oil World, Los Angeles, Cal.
Cloverdale Reveille, Cloverdale, Cal.
Colusa Daily Sun, Colusa, Cal.
Daily Commercial News, San Francisco, Cal.
Daily Midway Driller, Taft, Cal.
Del Norte Triplicate, Crescent City, Cal.
Exeter Sun, Exeter, Cal.
Gateway Gazette, Beaumont, Cal.
Goldfield News, Goldfield, Nevada.
Guerneville Times, Guerneville, Cal.
Healdsburg Enterprise, Healdsburg, Cal.
Humboldt Standard, Eureka, Cal.
Inyo Independent, Independence, Cal.
Inyo Register, Bishop, Cal.
Ione Valley Echo, Ione, Cal.
Lake County Bee, Lakeport, Cal.
Mining and Financial Record, Denver, Colo.
Mountain Democrat, Placerville, Cal.
Mountain Messenger, Downieville, Cal.
Nevada Mining Press, Reno, Nevada.
Oatman Mining News, Oatman, Arizona.
Oregon Observer, Grants Pass, Oregon.
Oroville Daily Register, Oroville, Cal.
Palo Verde Valley Times, Blythe, Cal.
Petroleum Reporter, Taft, Cal.
Placer Herald, Auburn, Cal.
Plumas Independent, Quincy, Cal.
Plumas National Bulletin, Quincy, Cal.
Randsburg Times, Randsburg, Cal.
San Diego News, San Diego, Cal.
Shasta Courier, Redding, Cal.
Siskiyou News, Yreka, Cal.
Stockton Record, Stockton, Cal.
Tuolumne Prospector, Tuolumne, Cal.
Ventura Daily Post, Ventura, Cal.
Weekly Trinity Journal, Weaverville, Cal.
Western Sentinel, Etna Mills, Cal.

PRODUCERS AND CONSUMERS

The producer and consumer of mineral products are mutually dependent upon each other for their prosperity, and one of the most direct aids rendered by the Bureau to the mining industry in the past has been that of bringing producers and consumers into direct touch with each other.

This work has been carried on largely by correspondence, supplemented by personal consultation. Lists of buyers of all the commercial minerals produced in California have been made available to producers upon request, and likewise the owners of undeveloped deposits of various minerals, and producers of them, have been made known to those looking for raw mineral products.

When the publication of *MINING IN CALIFORNIA* was on a monthly basis, current inquiries from buyers and sellers were summarized and lists of mineral products or deposits 'wanted' or 'for sale' included in each issue.

It is important that inquiries of this nature reach the mining public as soon as possible and in order to avoid the delay incident to the present quarterly publication of *MINING IN CALIFORNIA*, these lists are now issued monthly in the form of a mimeographed sheet under the title of 'Commercial Mineral Notes,' and sent to those on the mailing list for *MINING IN CALIFORNIA*.



EMPLOYMENT SERVICE

Following the establishment of the Mining Division branch offices in 1919, a free technical employment service was offered as a mutual aid to mine operators and technical men for the general benefit of the mineral industry.

Briefly summarized, men desiring positions are registered, the cards containing an outline of the applicant's qualifications, position wanted, salary desired, etc., and as notices of 'positions open' are received, the names and addresses of all applicants deemed qualified are sent to the prospective employer for direct negotiations.

Telephone and telegraphic communications are also given immediate attention.

Technical men, or those qualified for supervisory positions, and vacancies of like nature only, are registered, as no attempt will be made to supply common mine and mill labor.

Registration cards for the use of both prospective employers and employees may be obtained upon request, and a cordial invitation is extended to the industry to make free use of the facilities afforded. Parties interested should communicate direct with our San Francisco office.



PUBLICATIONS OF THE DIVISION OF MINES AND MINING

During the past forty-eight years, in carrying out the provisions of the organic act creating the former California State Mining Bureau, there have been published many reports, bulletins and maps which go to make up a library of detailed information on the mineral industry of the state, a large part of which could not be duplicated from any other source.

One feature that has added to the popularity of the publications is that many of them have been distributed without cost to the public, and even the more elaborate ones have been sold at a price which barely covers the cost of printing.

Owing to the fact that funds for the advancing of the work of this department have often been limited, many of the reports and bulletins mentioned were printed in limited editions which are now entirely exhausted.

Copies of such publications are available, however, in the office of the Division of Mines and Mining, in the Ferry Building, San Francisco; New Orpheum Building, Los Angeles; State Office Building, Sacramento; Redding; Santa Maria; Santa Paula; Coalinga; Taft; Bakersfield. They may also be found in many public, private and technical libraries in California and other states, and foreign countries.

A catalog of all publications from 1880 to 1917, giving a synopsis of their contents, is issued as Bulletin No. 77.

Publications in stock may be obtained by addressing any of the above offices and enclosing the requisite amount in the case of publications that have a list price. Only coin, stamps or money orders should be sent, and it will be appreciated if remittance is made in this manner rather than by personal check.

The prices noted include delivery charges to all parts of the United States. Money orders should be made payable to the Division of Mines and Mining.

NOTE.—The Division of Mines and Mining frequently receives requests for some of the early Reports and Bulletins now out of print, and it will be appreciated if parties having such publications and wishing to dispose of them will advise this office.

REPORTS

Asterisks (**) indicate the publication is out of print.

Price

**First Annual Report of the State Mineralogist, 1880, 43 pp. Henry G. Hanks	-----
**Second Annual Report of the State Mineralogist, 1882, 514 pp., 4 illustrations, 1 map. Henry G. Hanks	-----
**Third Annual Report of the State Mineralogist, 1883, 111 pp., 21 illustrations. Henry G. Hanks	-----
**Fourth Annual Report of the State Mineralogist, 1884, 410 pp., 7 illustrations. Henry G. Hanks	-----
**Fifth Annual Report of the State Mineralogist, 1885, 234 pp., 15 illustrations, 1 geological map. Henry G. Hanks	-----
**Sixth Annual Report of the State Mineralogist, Part I, 1886, 145 pp., 3 illustrations, 1 map. Henry G. Hanks	-----
**Part II, 1887, 222 pp., 36 illustrations. William Ireland, Jr.	-----
**Seventh Annual Report of the State Mineralogist, 1887, 315 pp. William Ireland, Jr.	-----

REPORTS—Continued

Asterisks (**) indicate the publication is out of print.

	Price
**Eighth Annual Report of the State Mineralogist, 1888, 948 pp., 122 illustrations. William Irelan, Jr.	
**Ninth Annual Report of the State Mineralogist, 1889, 352 pp., 57 illustrations, 2 maps. William Irelan, Jr.	
**Tenth Annual Report of the State Mineralogist, 1890, 983 pp., 179 illustrations, 10 maps. William Irelan, Jr.	
Eleventh Report (First Biennial) of the State Mineralogist, for the two years ending September 15, 1892, 612 pp., 73 illustrations, 4 maps. William Irelan, Jr.	\$1.00
**Twelfth Report (Second Biennial) of the State Mineralogist, for the two years ending September 15, 1894, 541 pp., 101 illustrations, 5 maps. J. J. Crawford	
**Thirteenth Report (Third Biennial) of the State Mineralogist, for the two years ending September 15, 1896, 726 pp., 93 illustrations, 1 map. J. J. Crawford	
Chapters of the State Mineralogist's Report, Biennial Period, 1913–1914, Fletcher Hamilton:	
**Mines and Mineral Resources, Amador, Calaveras and Tuolumne Counties, 172 pp., paper	
Mines and Mineral Resources, Colusa, Glenn, Lake, Marin, Napa, Solano, Sonoma and Yolo Counties, 208 pp., paper	.50
Mines and Mineral Resources, Del Norte, Humboldt, and Mendocino Counties, 59 pp., paper	.25
**Mines and Mineral Resources, Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin and Stanislaus Counties, 220 pages, paper	
Mines and Mineral Resources of Imperial and San Diego Counties, 113 pp., paper	.35
**Mines and Mineral Resources, Shasta, Siskiyou and Trinity Counties, 180 pp., paper	
**Fourteenth Report of the State Mineralogist, for the Biennial Period 1913–1914, Fletcher Hamilton, 1915:	
A General Report on the Mines and Mineral Resources of Amador, Calaveras, Tuolumne, Colusa, Glenn, Lake, Marin, Napa, Solano, Sonoma, Yolo, Del Norte, Humboldt, Mendocino, Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin, Stanislaus, San Diego, Imperial, Shasta, Siskiyou, and Trinity Counties, 974 pp., 275 illustrations, cloth	
Chapters of the State Mineralogist's Report, Biennial Period, 1915–1916, Fletcher Hamilton:	
**Mines and Mineral Resources, Alpine, Inyo and Mono Counties, 176 pp., paper	
**Mines and Mineral Resources, Butte, Lassen, Modoc, Sutter, and Tehama Counties, 91 pp., paper	
Mines and Mineral Resources, El Dorado, Placer, Sacramento, and Yuba Counties, 198 pp., paper	.65
Mines and Mineral Resources, Monterey, San Benito, San Luis Obispo, Santa Barbara, and Ventura Counties, 183 pp., paper	.65
Mines and Mineral Resources, Los Angeles, Orange, and Riverside Counties, 136 pp., paper	.50
**Mines and Mineral Resources, San Bernardino and Tulare Counties, 186 pp., paper	
**Fifteenth Report of the State Mineralogist, for the Biennial Period 1915–1916, Fletcher Hamilton, 1917:	
A General Report on the Mines and Mineral Resources of Alpine, Inyo, Mono, Butte, Lassen, Modoc, Sutter, Tehama, Placer, Sacramento, Yuba, Los Angeles, Orange, Riverside, San Benito, San Luis Obispo, Santa Barbara, Ventura, San Bernardino and Tulare Counties, 990 pp., 413 illustrations, cloth	
Chapters of the State Mineralogist's Report, Biennial Period 1917–1918, Fletcher Hamilton:	
Mines and Mineral Resources of Nevada County, 270 pp., paper	.75
Mines and Mineral Resources of Plumas County, 188 pp., paper	.50
Mines and Mineral Resources of Sierra County, 144 pp., paper	.50

REPORTS—Continued

Asterisks (**) indicate the publication is out of print.

	Price
Seventeenth Report of the State Mineralogist, 1920, Mining in California during 1920, Fletcher Hamilton: 562 pp., 71 illustrations, cloth-----	1.75
Eighteenth Report of the State Mineralogist, 1922, Mining in California, Fletcher Hamilton. Chapters published monthly beginning with January, 1922:-----	Free
**January, **February, March, April, May, June, July, August, September, October, November, December, 1922-----	Free
Chapters of Nineteenth Report of the State Mineralogist, 'Mining in California,' Fletcher Hamilton and Lloyd L. Root. January, February, March, September, 1923 -----	Free
Chapters of Twentieth Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly. January, April, **July, October, 1924, per copy-----	\$0.25
Chapters of Twenty-first Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly.	
January, 1925, Mines and Mineral Resources of Sacramento, Monterey and Orange counties-----	.25
April, 1925, Mines and Mineral Resources of Calaveras, Merced, San Joaquin, Stanislaus and Ventura counties-----	.25
July, 1925, Mines and Mineral Resources of Del Norte, Humboldt and San Diego counties-----	.25
October, 1925, Mines and Mineral Resources of Siskiyou, San Luis Obispo and Santa Barbara counties-----	.25
Subscription, \$1.00 in advance (by calendar year, only).-----	
Chapters of Twenty-second Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly.	
January, 1926, Mines and Mineral Resources of Trinity and Santa Cruz counties-----	.25
April, 1926, Mines and Mineral Resources of Shasta, San Benito and Imperial counties-----	.25
July, 1926, Mines and Mineral Resources of Marin and Sonoma Counties-----	.25
October, 1926, Mines and Mineral Resources of El Dorado and Inyo counties, also report on Minaret District, Madera County-----	.25
Chapters of Twenty-third Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly.	
January, 1927, Mines and Mineral Resources of Contra Costa County; Santa Catalina Island-----	.25
April, 1927, Mines and Mineral Resources of Amador and Solano counties-----	.25
July, 1927, Mines and Mineral Resources of Placer and Los Angeles counties-----	.25
October, 1927, Mines and Mineral Resources of Mono County-----	.25
Chapters of Twenty-fourth Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly.	
January, 1928, Mines and Mineral Resources of Tuolumne County-----	.25
April, 1928, Mines and Mineral Resources of Mariposa County-----	.25
July, 1928, Mines and Mineral Resources of Butte and Tehama Counties-----	.25
October, 1928, Mines and Mineral Resources of Plumas and Madera Counties-----	.25
Chapters of State Oil and Gas Supervisor's Report:	
Summary of Operations—California Oil Fields, July, 1918, to March, 1919 (one volume)-----	Free
Summary of Operations—California Oil Fields. Published monthly, beginning April, 1919:-----	
**April, **May, June, **July, **August, **September, **October, November, **December, 1919-----	Free
January, February, March, April, **May, June, July, **August, September, October, November, December, 1920-----	Free
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January, February, March, April, May, June, July, August, September, October, November, December, 1925-----	Free
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January, February, March, April, May, June, July, August, September, October, November, December, 1927-----	Free
January, February, March, April, 1928-----	Free

BULLETINS

**Bulletin No. 1. A Description of Some Desiccated Human Remains, by Winslow Anderson. 1888, 41 pp., 6 illustrations-----	\$0.50
**Bulletin No. 2. Methods of Mine Timbering, by W. H. Storms. 1894, 58 pp., 75 illustrations-----	
**Bulletin No. 3. Gas and Petroleum Yielding Formations of Central Valley of California, by W. L. Watts. 1894, 100 pp., 13 illustrations, 4 maps-----	
**Bulletin No. 4. Catalogue of Californian Fossils, by J. G. Cooper, 1894, 73 pp., 67 illustrations. (Part I was published in the Seventh Annual Report of the State Mineralogist, 1887.)-----	
**Bulletin No. 5. The Cyanide Process, 1894, by Dr. A. Scheidel. 140 pp., 46 illustrations-----	
Bulletin No. 6. California Gold Mill Practices, 1895, by E. B. Preston, 85 pp., 46 illustrations-----	
**Bulletin No. 7. Mineral Production of California, by Counties for the year 1894, by Charles G. Yale. Tabulated sheet-----	
**Bulletin No. 8. Mineral Production of California, by Counties for the year 1895, by Charles G. Yale. Tabulated sheet-----	
**Bulletin No. 9. Mine Drainage, Pumps, etc., by Hans C. Behr. 1896, 210 pp., 206 illustrations-----	
**Bulletin No. 10. A bibliography Relating to the Geology, Palaeontology and Mineral Resources of California, by Anthony W. Vogdes. 1896, 121 pp.-----	
**Bulletin No. 11. Oil and Gas Yielding Formations of Los Angeles, Ventura and Santa Barbara counties, by W. L. Watts. 1897, 94 pp., 6 maps, 31 illustrations-----	
**Bulletin No. 12. Mineral Production of California, by Counties for 1896, by Charles G. Yale. Tabulated sheet-----	
**Bulletin No. 13. Mineral Production of California, by Counties for 1897, by Charles G. Yale. Tabulated sheet-----	
**Bulletin No. 14. Mineral Production of California, by Counties for 1898, by Charles G. Yale-----	
**Bulletin No. 15. Map of Oil City Fields, Fresno County, by John H. Means. 1899-----	
**Bulletin No. 16. The Genesis of Petroleum and Asphaltum in California, by A. S. Cooper. 1899, 39 pp., 29 illustrations-----	
**Bulletin No. 17. Mineral Production of California, by Counties for 1899, by Charles G. Yale. Tabulated sheet-----	
**Bulletin No. 18. Mother Lode Region of California, by W. H. Storms. 1900, 154 pp., 49 illustrations-----	
**Bulletin No. 19. Oil and Gas Yielding Formations of California, by W. L. Watts. 1900, 236 pp., 60 illustrations, 8 maps-----	
**Bulletin No. 20. Synopsis of General Report of State Mining Bureau, by W. L. Watts. 1901, 21 pp. This bulletin contains a brief statement of the progress of the mineral industry in California for the four years ending December, 1899-----	
**Bulletin No. 21. Mineral Production of California by Counties, by Charles G. Yale. 1900. Tabulated sheet-----	
**Bulletin No. 22. Mineral Production of California for Fourteen Years, by Charles G. Yale. 1900. Tabulated sheet-----	
Bulletin No. 23. The Copper Resources of California, by P. C. DuBois, F. M. Anderson, J. H. Tibbits and G. A. Tweedy. 1902, 282 pp., 69 illustrations, and 9 maps-----	.50

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DETERMINATION OF MINERAL SAMPLES

Samples (limited to three at one time) of any mineral found in the state may be sent to the Division of Mines and Mining for identification, and the same will be classified free of charge. No samples will be determined if received from points outside the state. It must be understood that no assays, or quantitative determinations will be made. Samples should be in lump form if possible, and marked plainly with name of sender on outside of package, etc. No samples will be received unless delivery charges are prepaid. A letter should accompany sample, giving locality where mineral was found and the nature of the information desired.

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